SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Reviews of New Books.

THE METALLOIDS.

From time to time we have announced the issue of the several volumes forming part of the series of Scientific Manuals produced under the direction of Profs. Galbraith and Haughton, of Trinity College, Dublin, and in commenting upon their merits we have had, in every single instance, to allude to them in the highest terms of praise, as containing a vast amount of really useful information, in language so concise and perspicuous that the labour of study was materially reduced, whilst the knowledge acquired from them could be so stored in the mind as to be readily available at all times. The first volume of the Natural Science series—the Manual of the Metalloids*—is now before us, and, although necessarily of much greater dimensions than either of those which have preceded it, is thoroughly calculated to maintain the reputation of the series. The system upon which the work is arranged is most admirable—general principles being first carefully explained, and then (when the student has become interested in the subject) the details are entered upon. In the commencing portion of the volume a variety of topics of a general nature are discussed, the importance and chemical bearing of all of which may not be fully recognised on the first perusal, but it is essential that the reader should at starting make at least a general acquaintance with these preliminary subjects; as he proceeds through the body of the work he will frequently have to refer back to the introductory chapter, for the purpose of extending and rendering more accurate the knowledge which he has already acquired. The author states it has been an object to curtail the length of verbal descriptions, and give in as compressed a form as possible, keeping precision in view, all the information required by the student: we do not hesitate to state that this object has been attained.

The nature of bodies met with is, of course, first explained, so as to enable the student to comprehend the remarks upon affinity. The laws of combination are then considered, and next equivalent numbers, atomic weights, chemical notation and nomenclature, relations of atomic weights, laws of volume, and atomic volume. We are glad to observe that the binary system of atomic weights (or that which practical men generally are in the habit of using) has been adopted, and as we have only recently expressed a very decided opinion that the introduction of the unitary system is extremely inconvenient, and of very doubtful utility, we shall take the opportunity of giving what appears to us to be a very impartial review of its merits. In the year 1848 Charles Gerhardt, certainly one of the most original thinkers and distinguished chemists of modern times, prepared a table of atomic weights, founded on views materially different from those generally entertained: these views are at present under discussion. The system of Gerhardt may be supposed to rest on the following propositions—first, That the atomic volumes of all simple substances are equal. Second, that the same is true of the atomic volumes of the compound bodies. And third, that though the atomic volume of a compound appears in some instances to be that of an element, the ratios between the volumes of the smallest quantities of each which can exist in a separate state is really one of equality. Assuming the volume of a body to be equal to the atomic weight divided by the specific gravity, it is obvious that the volume will be doubled by doubling the atomic weight, or by halving the specific gravity. The former is done by Gerhardt in relation to oxygen, sulphur, and carbon, and he thus gets their atomic volumes the same with that of hydrogen. A similar result may be obtained with selenium, by doubling its atomic weight; and the same would probably be found to hold of tellurium, though we have in that case nothing to go upon but analogy, as the specific gravity of its vapour has not yet been determined. The doubling of the atomic weights of phosphorous and arsenic would, of course, similarly raise their atomic volumes; but this course has not been adopted, probably because of the great complexity of the chemical formulæ, which would thereby in certain cases be rendered inevitable. The advocates of the views of Gerhardt seem disposed to acquire for these two elements the same augmentation of atomic volume, by assuming that their vapour specific gravities, if taken at temperatures sufficiently high, would be diminished, and found to have only the halves of their existing values. If we are permitted to assume that the atomic weight of oxygen, sulphur, carbon, selenium, and tellurium should be doubled, and that the vapour specific gravity of phosphorus and arsenic are not what experiment makes them, but only the halves of the experimental determinations, we arrive at the first of the three propositions fundamental to the unitary system.

Adopting the ordinary table of equivalents, the great majority of chemical compounds have vapour volumes double that of hydrogen, but there are some cases where the vapour volumes are exactly equal (CS_2, CO, SO_2, SO_3, and HO for example). Gerhardt surmounts this difficulty by the doubling of the equivalents of O, C, S, &c., as explained. But there are cases which are not so easily dealt with, such as the chloride, bromide, and iodide of mercury, and the bichlorides of tin and titanium. These different substances, all of which are compounds of the first order, differ from the great majority of compounds, by having an atomic volume the same with that of hydrogen. The case, indeed, of the mercurial salts may be got over by restoring to mercury its original equivalent of 200; but this change is contra-indicated by the law of Dulong and Petit, and is not at present sanctioned by any chemist of eminence. From the facts just adverted to, which prove that several atomic compounds have the same atomic volume with hydrogen, and the well-established instances of compounds having a vapour volume 1·5, 3, 4, or 5 times that of same element, it would seem impossible to contend successfully for the truth of the second position fundamental to the theory of Gerhardt. The followers of Gerhardt maintain that all substances, whether they be elements or compounds, have the same atomic volume—that represented by 28·92, and they arrive at that result by adopting the rather paradoxical opinion that the vapours of simple substances in the free state have a *quasi* composite nature, their atoms being associated in pairs, so as to form the actual particles of which the vapour is made up. Thus hydrogen gas is not a mixture of single atoms of hydrogen, H, but of HH, consisting of two elementary atoms; and the vapour of mercury is composed not of single atoms of the metal, but of particles, HgHg, consisting of two atoms of the metal. These larger particles are termed *molecules*, and the conclusion adopted by the unitary chemists is not that the atomic volume is the same for simple and for compound substances, but rather that the volume of the *molecule* of an element is equal to the volume of an *atom* of a compound.

We now come to the only part of the unitary system which is at all worthy of admiration, and even here the defects seem to outweigh the merits. In the unitary system most substances, both mineral and organic, are considered as produced from a few others by the simple process of substitution. The typical substances, or those with one or other of which all others are supposed to have an analogous constitution, are but four in number—the molecule of hydrogen, *HH* (we print the unitary symbols in *italics*); hydrochloric acid, *HCl*; water, H_2O; and ammonia, H_3N; and the element which undergoes replacement is always hydrogen. Thus, if in the molecule of hydrogen *HH*, one of the atoms of hydrogen be replaced by ethyl C_2H_5, we get the hydrocarbon C_2H_5, or if both be replaced, C_4H_{10}. Hydrochloric acid, again, is converted into chloride of potassium by replacing its hydrogen by the metal, and into chloride of ethyl by replacing the hydrogen by ethyl. So water, H_2O, is converted into hydrate of potash, or oxide of potassium, according as one or both of the atoms in the molecule of hydrogen is replaced by the metal. Lastly, from ammonia numerous bodies may be derived, by replacing a portion, or the whole, of its hydrogen by some other principle. Thus, if the modifying substance be ethyl, the result will be the production of ethylamine, diethylamine, or triethylamine, according as one, two, or all of the atoms of hydrogen are replaced. When an atom of a compound replaces one atom of hydrogen it is said to be monatomic. But there are substances which are capable of replacing two atoms, and others still which can replace three atoms of hydrogen—the former are termed binatomic, the latter triatomic. In the formulæ they are thus distinguished: ethylene is written $(C_2H_4)''$ because it is binatomic, and phosphoryl (PO)''' because triatomic.

After this review of the unitary system, there remains little to be added in the way of commentary. Prof. Apjohn does not object, nor do we see great cause for objection, to the doubling of the equivalents of certain of the simple substances (it was long since done in the case of oxygen by Berzelius and Davy), but he feels, and we quite agree with him, that, after this step is taken, the elements cannot be concluded to have *all* the same atomic volume, for there are several of them of whose specific gravities we are entirely ignorant; and there are three of them—phosphorus, arsenic, and selenium—whose densities have been well determined, and are known to be inconsistent with such simple law. The atomic weights of the elements in question being doubled, the atomic volume of compound bodies will, generally speaking, be equal, but this is not invariably the case; and to adopt as a general conclusion a proposition affected by numerous well established exceptions, would appear to be a course quite at variance with the genius of a purely experimental science. The remaining postulate of the unitary system—that the molecules of the simple bodies are composed of atoms associated in pairs—is certainly of a questionable nature. It is not sustained by direct experimental evidence, and does not conduct to any practical results of such importance as would justify its adoption; for it is but a feeble argument in its support that, if received, the molecular volume of most simple and the atomic volume of most compound bodies will become equal to each other. But even though this and other difficulties could be surmounted, grave doubts may be entertained of the expediency of making Gerhardt's theory the exclusive basis of instruction in chemistry. The existing method seems entitled to preference from its comparative simplicity, and because of its resting exclusively on experimental evidence, and for these reasons will probably continue to be long employed by those who are occupied in chemical teaching.

We have no hesitation in declaring that Prof. Apjohn's review of the unitary system of atomic weights, from which we abstract the foregoing, is the best which we have seen, yet this section is certainly not superior either in point of clearness of expression, or of accuracy to any other individual portion of the book. Whether we take the sections treating of isomerism, chemical formulæ, isomorphism, dimorphism, the reaction of bodies on each other, the views of Berthollet in relation to the causes which determine decompositions, or the divisions of simple bodies, we find that, although the matter is compressed to an extent which almost appears marvellous, no useful facts have been omitted. The body of the work is conveniently arranged in six chapters, treating respectively of oxygen, hydrogen, and the compounds they form by combining with each other; of nitrogen and its compounds with oxygen and hydrogen; of sulphur, selenium, and tellurium, and their compounds with oxygen and hydrogen; of chlorine, bromine, iodine, fluorine, and their compounds with oxygen, hydrogen, &c.; of phosphorus, arsenic, and their compounds with oxygen, hydrogen, sulphur, the hallogens, and nitrogen; and of silicon, boron, carbon, and their leading compounds with oxygen, hydrogen, sulphur, nitrogen, and the hallogens. An appendix treating of the analysis of gases, hydrometers, weights and liquid measures, standard pressure and temperature, the relations to each other of the several thermometric scales, and the tension of aqueous vapour completes the work, with reference to which we have said sufficient to convince those desirous of quickly obtaining sound knowledge upon the subject treated of, that no work can be better suited to their purpose than that before us.

* "Manual of the Metalloids." By James Apjohn, M.D., F.R.S., &c., Professor of Chemistry, University of Dublin (Galbraith and Haughton's Scientific Manuals). London: Longmans and Co., Paternoster-row.

HISTORY OF MINING IN DEVONSHIRE.

When a district has become celebrated for any particular industry, the account of its rise and progress is generally interesting, and to the mine adventurer the mining history of a county is at all times acceptable. By learning the obstacles which those who have gone before them have met with, and the success which has been obtained subsequently, encouragement is offered to them, which cannot fail to prove advantageous. We have before us a carefully written little pamphlet, by Mr. Chowen,* tracing the history of mining in Devonshire from remote antiquity to the present time. The author observes that most people are familiar with the appearance and properties of the various metallic substances which are in daily use, and everyone knows how essential it is to the comfort and welfare of the inhabitants of a highly civilised country to have an abundant supply of the metals; while few, comparatively, are conversant with their history and the mode by which they are obtained. This induces him to describe the process and progress of mining in Devonshire. He reminds us that the mineral wealth of Great Britain has made this country what it is; has invested our island home with that national importance and superiority which contrasts so strikingly with its limited territorial extent, and he considers that in Devonshire mining is yet in its infancy, although possessing the richest copper mine in the world, and containing an unexplored field for legitimate mining enterprise second in extent and importance to none in the kingdom.

The supplies of tin were originally derived from the Scilly Islands, the Ancient Cassiterides, or wild and romantic cluster of rocks about nine leagues from the Land's End; but it was from Cornwall and Devon that the chief supply of tin and lead was obtained. Dartmoor, a granitic range of hills, the back-bone of the county, abounds with the vestiges of ancient tin mining in innumerable stream works, which have lain deserted for centuries. The method of mining practised by the Danmonii was of the most simple character. Their mining utensils were formed of wood, made from the box, the oak, or the elm tree, for iron at that remote period had not come into use. The tin was obtained from the sedimentary deposit which for ages had been accumulating in the valleys. This metalliferous stratum consisted then, as now, of a heterogeneous mixture of peat, gravel, the debris of the decaying tors and tin ore matter which from time to time had been swept by mountain torrents from the neighbouring hills, and during floods carried pell mell into the glens below, there to be quietly deposited on the subsidence of the waters. Thence in those times the tin was, probably, obtained with as little trouble as peat is at present. The mines were either open cuttings or shallow explorations, and the ore procured by merely burrowing beneath the surface, a process now called shoding and streaming. The metalliferous gravel or tin ore thus obtained, being of greater specific gravity than the surrounding matrix, was easily separated by washing, and with, perhaps, less trouble still, melted and cast into moulds. Tin fuses very readily. The metallic tin, according to Whitaker, was then beaten into squares, and some of it formed into drinking cups, pitchers, and basins. The surplus was collected for exportation, and taken, in the first place it is said, to the Isle of Wight, the mart for those whose traffic was in tin. Thence it was conveyed by Gallic traders to Marseilles and Narbonne, on the shores of the Mediterranean, where it was brought up by factors, and transmitted over land to Central Asia, and even to the most remote provinces of India. In exchange for their tin the Ancient Britons received salt, earthenware, and brass, articles which were highly esteemed among an uncivilised people, although intrinsically of less value to their possessors. According to Strabo and Tacitus, gold and silver were also raised in this county, and there can be no doubt that it was so. Even at the present day gold is frequently found in small quantities intermixed with tin ore. Indeed, historians have attributed the exaggerated notions which the Romans had formed of the quantity of the more precious metals existing in Britain as the chief incentive to the descent of that people on the island; although there appears no evidence of their having employed themselves in mining, at least in this county, after Britain became a Roman province. That the Saxons were equally negligent of the mineral resources of the county is manifest from the circumstance that no mention is made in "Domesday Book" of Devonshire mines. Had such works been in operation the agents of the Conqueror would have recorded the fact in the "Domesday Survey." In progress of time, and after this country was completely subjugated, the Normans are said to have engaged in mining with advantage. Thus have we the history of Devonshire mining brought down to the period of the Norman Conquest.

The matter for the succeeding chapter is obtained chiefly from the musty records of the Tower. It is found that kings and commoners, nobles and parsons, were severally the proprietors of the mines, for there is a fascination inherent in mining which, to some persons in every degree, is perfectly irresistible. Of these adventurers some were unusually successful, others were less fortunate. Earl Richard, King of the Romans, made the greatest hit. But they one and all did well, save the parsons, who do not appear to have improved their fortunes. After the Conquest the earliest accounts we have of Devonshire is in the reign of Richard I., when the produce of the mines was one of the principal resources of the earldom of Cornwall. In the 10th year of King Richard's reign, the earldom being then in the Crown, William de Wortham accounted to the Exchequer for the ferm and issues of the tin mines of Devon and Cornwall, and in the 14th year of King John's reign the same individual accounted for the sum of 100 marks for the ferm of the Stannaries in Cornwall, and 200*l.* for that of Devon, from which it is evident that the mines of the latter county were at that time more productive than those of the former. It appears, however, that the mines were not then so productive as they soon afterwards became, for the immense wealth then enabled Earl Richard., in the reign of Richard III., 1257, to purchase the title of King of the Romans, was attributed by foreign historians to the revenue which he derived from the mines of his earldom. After alluding to the privileges granted to the miners, and to the Charter of Edward I., which separated the Devonshire Stannaries from those of Cornwall, though still retaining in common one lord warden, he tells us that during the latter part of this reign the Treasury was much enriched by the unusually great returns of the lead mines of Beer Alston and Combe Martyn. In the year 1293, William de Wymondham accounted to the Treasury for 270 lbs. of silver raised in this county, which was given towards the portion of the king's daughter Eleanor, then married to the Duke of Barr. Three years subsequently, there were impressed 360 miners out of Derbyshire and Wales to work in the Devonshire mines, which yielded a great profit. Towards the close of the reign of Edward II., in 1326, the mine of Brylande, which is supposed to have been the Beer Mine, was then in the king's hands, and certain persons were empowered to elect miners in the counties of Devon and Cornwall, and to bring back such as had deserted from the works. He then narrates the successes and failures from time to time recorded, until at the period at which when Chapple wrote his "Review of Risdon," in 1770, it would appear that mining had scarcely existence in Devonshire, for in alluding to Risdon's account of the miners before mentioned, he tells us that no such labourers were then in the county. It is highly probable, however, that Chapple did not make sufficient enquires into the subject, for mining was certainly carried on in it in his time. During the early part of the 18th century the lead mines in Mary Tavy were worked by Mr. Moore, who was also engaged in searching for copper in this and some of the neighbouring parishes. Not long after this period mining again started into notice; some small quantities of tin, the produce of a mine on Dartmoor, wrought by certain poor men, about 80 years since, attracted the notice of speculators, who engaged in numerous undertakings of the kind, and not finding in their own neighbourhood a sufficient number of persons of the same views as themselves, endeavoured to obtain support in London, and with some success. Many mines were thus set to work, but for want of skill or discretion they generally proved unprofitable. This brings the history of mining in Devonshire down to the close of the 18th century.

The tin mines now at work in this county are, he observes, on the southern flank of the Dartmoor range, and comprise the Ashburton United, Bottle Hill, and Birch Tor Mines, and a few smaller concerns. The quantity of tin raised in these mines is inconsiderable, not sufficient to defray the expense of working, the result, it is believed, of conducting the operations on too limited a scale. Tin mining in Devonshire has of late years been very much neglected, a matter of astonishment, considering the high price which this mineral has maintained for so long a time, and that it is still worth upwards of 70*l.* per ton. The county affords an almost unlimited field for the discovery of tin ore, and, under judicious management, capital might be employed in such an enterprise with advantage. Copper mining in Devonshire is of comparatively recent origin. Three centuries ago the value of this metal was scarcely known to the Devonshire miner, for, unlike tin, copper ore is not to be found in alluvial deposits, hence there are no stream works for copper. Deposited generally at much great depths than tin, it required elaborate machinery of very great power to drain the mines and draw up the copper ore, and it is only within the last 150 years that this ore has been much sought for, but when the demand for it increased, and the value of the mineral became better known, mining assumed quite a different character in the county. During the present century Devonshire has been the scene of considerable mining enterprise; and many well-directed efforts have been made in tracing the metalliferous veins, and proving their latent value. These explorations, and it is always so, have resulted sometimes in disappointment and loss, the quantity of ore raised not proving of sufficient value to defray the current expenses of the mines, but, on the whole, mining in Devon has proved a brilliant success.

The Devonshire copper field comprises three distinct districts—the Tavistock and Ashburton districts, in the south; and the North Molton copper country, in the northern division of the county. Of these several localities the Tavistock district occupies the most important position, containing among a group of mines the richest copper mine in the world. The copper mines of Tavistock are found in a basin of metalliferous slate occupying the tract of country which extends from the north-western flank of Dartmoor to the River Tamar, the western boundary of the county; and it is an interesting fact, deserving special notice, that the two richest mines in this district are located at each extreme of this channel of ground—the Wheal Friendship at the east, and Devon Great Consols at the farthest point west, and distant about five miles from each other. The most prominent geological feature in this locality is the great development of clay-slate, and another feature equally conspicuous is the absence of a run of mines that should naturally occupy the line of country which bridges over the space between the Wheal Friendship and her colossal sister, the Devon Great Consols. This intervening ground, mineralised so thoroughly as it is, and traversed by so many copper lodes, remains nevertheless comparatively untried. Since the original discovery the Devon Great Consols has paid in dividends, including the lord's dues, nearly one million sterling; the gross value of copper ore sold exceeds two millions, and the mine is still in the hey-day of its prosperity, yielding a profit of some 50,000*l.* per annum to the shareholders, and an additional 10,000*l.* a year to the Duke of Bedford, with every prospect of a brilliant future. The other copper mines in this locality in effective working and returning copper ore are the Bedford United Mine (which has paid 52,000*l.* in dividends), Crebor (formerly very rich), East Gunnis Lake, East Russell, Gawton, Lady Bertha, Crelake, North Robert, and Sortridge. Those not yet returning ore are East Devon Consols, Devon Union, and Wheal Fortescue. The Ashburton copper district comprehends the killas country, which skirts that portion of the southern flank of the Dartmoor range. This district, which is just emerging into importance, has not yet produced any notable mine, although it is believed to contain the elements of success, and that something good will by-and-bye turn up. The mines now at work are Yarner, Wheal Emma, Brookwood, and a few minor concerns. These mines, although returning considerable quantities of copper ore, are not yet profitably productive. The North Molton district is yet in its infancy, and mining is here at a very low ebb. Two mines only are at work—the Bampfylde and Molland, copper mines. Each of these mines, however, produces copper ore, in quantities nearly sufficient to defray the working expenses. It is a matter of surprise that so little attention is directed to the mineral resources of this part of the county, which abounds in lodes of more than ordinary promise. The copper mines of Devonshire are all found in the slate, no mine having hitherto been discovered in granite. The kind of ore which predominates is the yellow sulphide, which yields an average price of about 5*l.* per ton. The lead mines of Devonshire are more ancient, and have yielded a much greater quantity of silver than those of any other part of the kingdom.

From this comparatively brief outline of Mr. Chowen's book it will be seen that to those connected with Devonshire mines it is replete with interest, whilst from the admirable manner in which the particulars are recorded it will prove scarcely less attractive to the general reader. The pamphlet is worthy of forming a model for the arrangement of similar histories of the other mining counties of the kingdom.

* "Some Accounnt of the Rise and Progress of Mining in Devonshire from the time of the Phœnicians to the Present." By G. Chowen. Tavistock: Cleave. London: *Mining Journal* office, 26, Fleet-street, E.C.

THE ELEMENTS OF GEOLOGY.

Although the science of geology is invariably acknowledged to be a highly interesting study by those who have had sufficient courage to surmount the many obstacles which are met with in commencing it, it cannot be denied that to the uninitiated a geological book is as repulsive as is his first Latin grammar to the schoolboy. In the work before us* Prof. Jukes has undertaken, and, we think, well succeeded in rendering the acquisition of the first principles of geology less laborious than it has hitherto been, so that henceforth we may hope to find a larger number of lovers of the science. The development of the science of geology has been materially impeded through the egotism of men of comparatively low scientific attainments having led them to advocate theories incapable of support, except by sacrificing and denying the recorded facts collected by men of undoubted integrity and veracity. Thus we have had igneous, aqueous, and magnetic theories, struggling together for supremacy, although the advocates of the newer systems have been unable, even by resorting to misrepresentation, to do more than prove that the originally adopted views were open to certain corrective modifications. Had those who have attempted to introduce those newer theories been content to record their observations with care and accuracy, and leave other and more competent men to draw conclusions from them, not only would the development of the science have been more rapid, but they would have acquired greater honour for themselves. In a science based so entirely upon extended observations, as geology must necessarily be, it requires men who have made the generalisation of facts their special study to lay down a theory with even the probability of success; and when we consider that, as Prof. Jukes observes, the chief difficulties of the young geologist "is the want of the preliminary elementary knowledge of the collateral sciences of physics, chemistry, mineralogy, zoology, and botany," we can readily comprehend the cause of the failure of the theorists, who have attempted to overturn the very foundations upon which the science of geology has been raised, although possessing but a limited knowledge of the three first of the collateral sciences mentioned, and being comparatively ignorant of the very existence of the remaining two.

The mode in which Prof. Jukes has arranged his information is admirable, and, upon the whole, he has not been unsuccessful in his endeavour to compensate for the absence of general training in the natural sciences which he knows will exist (if absence can be said to exist) amongst the majority of those who will study his book. The work is divided into three main sections, treating respectively of the geological operations now in action; of some of the facts observable in the crust of the earth; and of the history of the formation of the earth's crust, deduced from the facts observable in it, as interpreted by the operations now going on. These are subdivided into twenty-four chapters, so as to admit of the facts being satisfactorily apprehended. In the first place, the earth, as a whole, is considered, its form, size, and specific gravity first receiving attention, and the recorded facts relative to the temperature of deep mines and wells, hot springs, and igneous rocks. The conclusions to be drawn from this chapter is that the interior of the earth is intensely hot—hot enough, at all events, to keep such rock as basalt or whinstone in a completely molten state. If we were to suppose that the increase of temperature went on at the same rate indefinitely into the interior as that which regulates it in our mines and wells, or even if we allowed that it increased at a slower rate

—say, for instance, 1° Fahr. for every 100 ft., or 52° Fahr. for every mile—we should arrive very shortly at an intense temperature. At a depth of about 3 or 4 miles beneath the British islands the rocks would be as hot as boiling water, or 212° Fahr.; at a depth of 50 miles we should find a temperature of 2600° Fahr., or a heat sufficient to melt steel; and at 100 miles we should get a temperature equal to more than 5000° Fahr., which is a heat greater than any that we know of at surface. It is not by any means necessary, however, to suppose that the temperature does increase indefinitely into the interior, or that the rate which regulates its increase near its surface continues to be the same for such depths as those mentioned above. Neither does it follow that the materials, whatever they may be, that exist at great depths, would be melted by the same amount of heat that would fuse them at the surface, since the enormous amount of pressure which they must experience may keep them solid, in spite of the heat. Little or nothing is, in fact, known about the constitution or condition of the interior, nor have we any grounds even for speculation, further than those which are detailed in the chapter.

The reasons which justify the belief that the earth has a great internal temperature having been detailed with such clearness that, at least until discoveries not hitherto made are brought forward to prove the contrary, it may be regarded as an indisputable fact, the consideration of the form and structure of volcanoes, their distribution, and the time required for the formation of existing volcanoes, is proceeded with. We have, then, a chapter on Lavas and Igneous Rocks, containing a brief sketch of chemical technicalities, and some reference to elementary substances, compounds, acids, bases, salts, &c., in order to enable the reader the better to comprehend what follows. The consideration of Earthquakes, and the Rise and Fall of Ground occupies the two succeeding chapters: in the former the connection between volcanoes and earthquakes, the frequency, phenomena, and effects of earthquakes, and the power of earthquake force being treated of; whilst the latter is devoted to the subjects of elevation and depression during earthquakes, movements without earthquakes, and the difficulties of proving depression. Combining all the evidence given, and taking into account that which follows, on the form of coral islands, we should arrive at the conclusion that the crust of the earth is in frequent, if not in constant, movement in some part or other: large portions remain stationary for long periods, while others are being elevated, and others depressed. We know that the sea, with its present level, has once flowed over the spots now occupied by our loftiest mountains. On the other hand, there is nothing improbable in the belief that land once existed where now the deepest parts of ocean are to be found. Mr. Darwin observes of the earthquake which he felt near Valdivia in 1835—"It was something like the movement of a vessel in a little cross ripple, or still more like that felt by a person skating over thin ice, which bends under the weight of his body. A bad earthquake at once destroys the oldest associations; the world, the very emblem of all that is solid, has moved beneath our feet, like a crust over a fluid. The geologist, as he pursues his studies, learns to generalise this feeling, and to apply it to the whole crust of the earth during all geological time. He finds that it always has been as it now is—utterly unstable, rising here and falling there, with long, slow undulations, ever shifting under the liquid ocean, and moving from place to place, as parts of its old bed are lifted up above its surface, and new hollows formed by the sinking of other shores." The rocks formed of animals and plants are next described, and then those formed from the broken materials of other rocks. This brings him to the conclusion of the geological operations now in action; and that the student's task may be rendered as easy and pleasant as possible, he summarises the whole of the information given before entering upon the second portion of the subject.

The elucidation of some of the facts observable in the crust of the earth occupies half-a-dozen chapters, and here the Professor demonstrates not only the considerable extent to which he has utilised the large amount of observation he has been enabled to make, but also his more than ordinary ability to point out the principal features to which the geological student should direct his attention. The chapters comprised in this portion of the book treat respectively of stratification and joints; inclined beds; bent and broken beds; metamorphic or altered rocks, cleavage, foliation, concretions, and mineral veins; denudation and unconformability; and of fossils and their mode of occurrence. The subdivisions of the chapters are made with great judgment, that on fossils and their mode of occurrence, for instance, including petr fi-ation, the distribution of fossils in stratified rocks, naming of groups of stratified rocks, lateral change of beds, vertical distribution of fossils, and fossils changed with time. With reference to veins and lodes, in which a large number of the readers of the *Mining Journal* are interested, Prof. Jukes observes that most hard rocks are traversed by small cracks running in various directions, and filled with some kind of spar; these are quite distinct from joints, and have altogether a different origin. They are irregular veins, often branching and splitting up into small tortuous strings. The spar found in these veins is usually calc-spar in limestone rocks, and quartz in all silicious rocks; other minerals sometimes occur, but rarely in comparison with these two. It is clear, then, that the spar which fills these veins was derived from the adjacent rocks by solution, and deposited in the veins by crystallisation. Occasionally these veins are of considerable size, as much as 2 or 3 feet in width, and many yards in length. Some of the numerous caverns also which occur in all limestones are sometimes filled up with calc-spar, with or without crystalline deposits of galena or sulphuret of lead and other substances. These veins often resemble in form some intrusive veins of igneous rock, but they may be distinguished from them not only by their being filled by substances which are evidently not the products of fusion, but by their not proceeding from larger masses of igneous matter, which igneous veins can almost always be traced to.

In other districts other veins occur, which are called sometimes mineral or metallic veins, and sometimes lodes. A true lode is in reality a fault or fissure, caused by fracture, in which open spaces have be left for a time, because of the hardness of the walls and the irregularity of the fracture. These fissures have subsequently been filled up with crystalline deposits of various minerals, which are called spars or ores, according as they contain mere earths or useless metals, such as calcium; or the more useful metals, such as zinc, lead, copper, silver, gold, &c. Iron ore sometimes occurs in lodes, but is much more often procured from beds, or from veins of a different character. True lodes sometimes resemble in their form dykes of igneous rock, but they may be at once distinguished from them by the nature of their contents, and by the respective difference in their relations to the surrounding rock. In what way the mineral contents of lodes or mineral veins have been brought into them is a question to which no sufficiently authoritative and satisfactory answer has yet been given. Some persons suppose them to have been filled by minerals sublimed from the interior of the earth, and appeal to the prevalence of sulphurets and arsenurets among the ores in support of their belief. Sulphurets of iron, of zinc, and of lead, however, are found in great abundance in situations where it is impossible they could have had this origin. Crystals of galena and blende are found even in the inside of close ironstone balls. It is, moreover, impossible to apparate the origin of the ores from that of the spars in which they are entangled or embedded, and as these are chiefly quartz, and other substances to which we cannot attribute an igneous origin, it is equally difficult to refer the ores to that source. Many other considerations might be adduced in favour of the supposition that the contents of mineral veins were in some way derived through the influence of water, from the very rocks which they traverse. Mr. Were Fox and others have pointed to magnetic currents as probably connected with their origin. The whole subject, however, is one which must be classed among those parts of geology which still remain a *terra incognita*. All that geologists know merely shows that there is something to be learned, and as that learning can only be gained by continued observations in mines, the geologists must look to the miners for their instruction. In contemplating, says Prof. Jukes, vast periods of past time, such as those which geology compels us to deal with, they sometimes appear to diminish, according to their remoteness, just as vast distant spaces dwindle in the eye. If we could visit one of the nearest fixed stars, and still see the earth, the space between it and the sun would appear to be nothing, and our little globe would seem to be rubbing against the greater luminary as it revolved round it. The 95,000,000 miles, seemingly annihilated in the one case, are only a fair image of the many times 95,000,000 of years that elude the grasp of our mental vision in the other.

The third and concluding section of the work—that containing the history of the formation of the earth's crust, deduced from the facts observable in it as interpreted by the operations now going on—now only remains to be alluded to. By the time the reader has arrived at this portion of the book he will have acquired such an amount of elementary knowledge that the science of geology will be felt to be a less repulsive study; he will, consequently, be very likely to feel that the Professor has been unreasonably concise, and has provided far less information than the importance of the subject would have justified. But let it not be thought that the author has tired of his task, or has misunderstood the requirements of the student for whose especial use the book has been prepared: the feeling of dissatisfaction—and we have no doubt that this is a feeling that will very generally manifest itself—is the highest compliment that Prof. Jukes could wish for, since it affords the only really conclusive evidence that he has succeeded in making additional converts to the ranks of geological enquirers. That few will attentively read and consider the first two sections of the School Manual of Geology without acquiring the desire to continue the study of the science we are convinced; and many who have long passed the period of their school-days will find in the third section an amount of information which will of itself give them a clear insight into the principles of the science, or afford them very material aid if they intend to study more elaborate works. Technical names are only employed when absolutely necessary, and as the English equivalent of each Latin term has been given for the enlightenment of those who are unacquainted with geological Latin, the chief difficulty of remembering the names will be removed, more especially as it must be assumed that the reader is entitled to as much license with the construction of sentences from the words at disposal, as *savans* exercise in the construction of Latin words. Using this license, and accepting Prof. Jukes's translations, a large number of the names of fossils will become indelibly impressed upon the memory. Thus—*Illaenus Davisii* becomes squint-eyed Davis; *Pentamerus Knightii*, Knight's fifth part; *Phillipsia pustulosa*, pock-marked Prof. Phillips; *Lichas Hibernicus*, the Irish boy who brought Hercules the poisoned shirt, and so on; yet it cannot be doubted that amongst those who have studied the science these names are well understood, and being associated with particular know objects, are as easily remembered as those of domestic articles in every-day use.

The work, though small in size, is very amply illustrated, well and very legibly printed, and tastefully though neatly bound, whilst with regard to the contents, we have already said so much upon the excellency of the individual chapters that it would be almost superfluous to add that the work is one which cannot fail to meet with general approbation, and to do much to promote the study of one of the most interesting sciences with which we are acquainted.

* "The School Manual of Geology." By J. BEETE JUKES, M.A., F.R.S. Edinburgh: Adam and Charles Black.

THE POST OFFICE LONDON DIRECTORY FOR 1864.—The London citizen has become so accustomed to regard the Post Office London Directory as the most necessary of the Christmas annuals, that he looks forward to its reception as anxiously as to the ordinary festivities of the season; yet every volume tells him by its growth how time fleets on. The present volume is nearly 100 pages larger than that which preceded it, the total number in the book now reaching the enormous quantity of 2428. In a work of such a size, and at the same time so useful and indispensable as to be constantly referred to, it can readily be supposed that something like an index is absolutely necessary, yet inasmuch as a directory is of itself an index, the means of providing such a desideratum does not at once present itself. In the edition for the forthcoming year, however, the wished-for information is briefly and admirably given in the form of an introduction, after the perusal of which it can scarcely be conceived that any difficulty can arise in making a search. Though every effort has been made to compress the information within the narrowest possible limits, the bulk has been increased to the extent we have mentioned, the reason of which will be obvious when it is stated that no less than 50 trades new to London are inserted in this years issue—pyrites merchants, wind-engine manufacturers, and talc and mica merchants being among the number—for the first time. To show the great attention which is paid to accuracy, and that every information obtainable up to the moment of publication, we may state that, although the Directory was issued on Dec. 11, the names of Sir R. P. Collier, gazetted Nov. 27, is given as Solicitor-General; of Sir Gillery Pigott, gazetted Dec. 4, as Baron of the Court of Exchequer; of Mr. Humphery, gazetted Nov. 24, as the member for Andover; and of the Prince de la Tour d'Auvergne, presented at Court on Dec. 2, as the ambassador of the French; whilst the death of Mr. Bonamy Dobree, sen., announced in the *Times* of Nov. 26, is duly noticed by the removal of the name from the Official Directory, from the list of the directors of the Bank of England, and from the list of the City Lieutenancy. With regard to the insertions, it should be stated that they are not made in the form of "*errata*" (a list of corrections too late for insertion brings down the information to a still later date than either of the events we have noticed), but the correction is made throughout the several divisions of the work—the names, in fact, appearing precisely in the same manner as though the individuals mentioned had been in their present office for years. To comment extensively upon the sixty-fifth edition of a book is scarcely necessary, yet we must state that that before us is one of which every edition is sure to be more largely patronised than that which has preceded it.

FAMILY ATLAS.—The admirable atlas originally published under the superintendence of the Society for the Diffusion of Useful Knowledge, has been carefully revised, by the insertion of the numerous discoveries which have been made since its first issue, and is now in course of republication by Mr. Edward Stanford, of Charing Cross. The present issue is to be completed in twenty half-crown parts, and will form one of the handomest volumes that could be wished for. It will comprise a collection of eighty maps, constructed by eminent geographers, with the latest discoveries and emendations, including the geological map of England and Wales, by Sir Roderick Murchison, the Star maps by Sir John Lubbock, and plans of London and Paris. The maps are systematically and uniformly coloured, and great facilities are thus offered for seeing at a glance the dependencies of a particular country. For instance, the colonies and possessions of England, France, Spain, and Portugal, have each a distinctive colour, which corresponds with that of the mother country, and is maintained throughout the whole of the series. The first two parts, which are before us, contain the World, on Mercator's projection, Africa, New Zealand, Switzerland, Italy, Asia, and the United States. The maps are beautifully engraved, and the names of places inserted, although very numerous, may consequently be read with the greatest facility. The addition of the ledger-index principle on the margins of the maps enables any one of the series to be referred to instantaneously, and thus the atlas combines in an extraordinary degree ornament with utility.

"KNOWLEDGE FOR THE TIME."—Another of Mr. J. Timbs's excellent little manuals—or, perhaps, it would be more accurate to designate them educational scrap-books—has just been issued by Messrs. Lockwood and Co., of Stationers' Hall-court. Mr. Timbs very truly observes that truth is not of such easy acquisition as is generally supposed, and the chances of obtaining unprejudiced accounts of events are rarely improved by distance from the time at which they happen. Throughout the work the author has endeavoured to avail himself of the most reliable views of leading writers on events of the day, and by seizing new points of knowledge and sources of information, to present in a classified form such an assemblage of facts and opinions as may be impressed with warmth and quickness on the memory, and assist the formation of a good general judgment. Wordiness has in every case been avoided, and the author has thus been enabled to compress more than 300 abstracts, abridgments, and summaries into about the same number of pages. The volume gives historico-political information, history of the progress of civilisation, dignities and distinctions, changes in laws, measure and value, progress of science, life and health, and religious thought, the whole being concluded by an appendix upon the great question of Edinburgh and Dublin precedence. It matters not where the book is opened, one is sure to find something to interest us, whether it be the opinion of the late Baron Alderson on receiving the intelligence of Louis Napoleon's *coup d'etat*—"the best thing that can happen for France will be for him to be made king or emperor, and hold his ground in spite of conscience, oaths, and faith, which he pledged to the republic;" whether it be the comparison of the cost of Roman roads and British railways, or Sir James Scarlett's appreciation of brevity when he expressed the opinion that "when I exceed half-an-hour I am always doing mischief to my client, for if I drive into the heads of the jury important matter, I drive out matter more important that I had previously lodged there;" or whether it be a cure for yellow fever. As the yellow fever is a desease with which many of our readers have to contend, and as it is upon the authority of H. M. vice-consul at Cape Bolivar we shall reproduce it:—"An old woman, named Mariquita Orfila, has discovered a perfect remedy for the black vomit and yellow fever, by means of which several persons have been completely cured after a consultation of doctors had declared that the cases were quite hopeless, and that the patients must die in a few hours. The remedy is the juice of the pounded leaf of the verbena, given in small doses three times a day, and injections of the same every two hours until the bowels are emptied. The verbena is a wild shrub, to be found growing almost everywhere, and particularly in low moist ground. All our doctors have adopted its use, and now few or none die of those late fearful diseases. There are two kinds of it, male and female; the latter is most used." The general character of Mr. Timbs's books are so well appreciated that it is only necessary to make known that another volume has been completed to ensure its being patronised, and with regard to the present we might almost say that it is unusually interesting.

POCKET BOOK OF ENGINEERING FORMULÆ.—We have already alluded in favourable terms to the valuable little work bearing this title, and we have now before us the new edition, which has just been issued by Messrs. Spon, of Bucklersbury. The accuracy and fullness of Mr. Molesworth's book left little to be desired, yet an almanac for the ensuing year has been inserted, and a compendious supplement added, which makes the work approach very nearly perfection. The supplement has been supplied by Mr. J. T. Hurst, C.E., and adds 24 pages to the size of the book, which still retains the diminutive size which is so great a recommendation to it. The length is 5 in., the breadth 3 in., and the thickness under ½ of an inch, so that there is nothing to prevent its being made a constant companion. The book is one which no practical man should be without, for there are innumerable data to which he constantly requires to refer, and which he can only otherwise possess in the form of rough manuscript notes, which it is well known are never forthcoming when wanted. As many of the readers of the *Mining Journal* are interested in knowing the effective horse power for different water-power motors, we extract the following particulars from Mr. Molesworth's pocket book:—The theoretical power of water being 100; undershot water-wheels give 35; Poncelet's undershot water-wheel, 60; breast wheel, 55; high breast, 60; overshot wheel, 68; turbine, 70; hydraulic ram raising water, 60; water-pressure engine, 80. The consideration of the particulars given in the pages of the book will frequently lead to the discovery of the means of obtaining the maximum of economy.

CHRISTMAS ANNUALS.—The year's numbers of that instructive and interesting little "monthly," in connection with the "British Workman"—THE CHILDREN'S FRIEND—has just been issued by Messrs. Seeley, Jackson, and Halliday, the popular theological booksellers of Fleet-street. The style of binding being very attractive—illustrated boards, in which the warmer colours are prominent—the volume forms one of the most charming Christmas presents for children that can be desired. The price being only 1s. 6d., it is obviously within the reach of all, whilst the book is sure to be appreciated by every child into whose hands it is placed.

THE BRITISH WORKMAN.—The yearly volume of the "British Workman," which has long since taken a place almost amongst the necessaries of life in many families, and from which probably more good is diffused than from any other periodical printed, has just been issued by Mr. Partridge, of Paternoster-row. The numbers for the present year have been unusually interesting, and the volume is rendered especially attractive as a gift-book by being enclosed in a handsome illuminated wrapper, with an admirably executed engraving of "Henry VIII. and the Miller of the Dee." The book would form a Christmas present of which any girl or boy in the kingdom would be justly proud.

BAND OF HOPE REVIEW.—The yearly part of this excellent little periodical has just been issued at 1s. by Mr. W. S. Partridge, of Paternoster-row. The book is published in a handsome wrapper, with the well-known picture—"Oh!"—the boy that went a sliding on his way from market and had a downfall—in a first-rate style of chrome-lithography as a title page. The annual is full of engravings beautifully executed, and will be found an acceptable present for children at the present season.

RED LETTER DIARIES.—The commercial forms of De la Rue's Red Letters Diaries have now been issued. The beauty of the printing and the high quality of the paper are fully equal to that of previous years. As a frontispiece to this year's issue is a beautifully executed photograph of the moon, by Messrs. Smith, Beck, and Beck, from Mr. Warren de la Rue's original negative. The Red Letter Diaries are well suited for the counting-house, and for practical purposes generally.

LEVER'S MINING ALMANAC.—The large sheet almanac bearing this title has been issued for the ensuing year. It comprises, in addition to the usual calender matter, lists of the Geological Society, Manchester Geological Society, Royal School of Mines, North of England Institute of Mining Engineers, Institution of Engineers in Scotland, Bristol Mining School, South Wales Institute of Engineers, Glasgow School of Mines, Royal Cornwall Polytechnic Society, &c., and a variety of information of interest to those engaged in connection with our mineral industries.

MANUFACTURE OF ALUMINIUM.—The process in use at Salyndre Works, as described by Mr. A. Stewart, has been published in a recent issue of the *Revue Universelle*. They are working a very valuable ore, furnishing pure alumina by two very simple operations, which now renders the preparation of aluminium an actual metallurgical operation in the Ollioneles, near Toulon. Its average composition is—alumina, 60 per cent.; oxide of iron, 25; silica, 3, and water 12 per cent. = 100. After being pulvering under an edge-runner, it is mixed with soda, and heated in a reverberatory furnace. The mass, although not even agglutinating, becomes changed into an aluminate of soda, and a double silicate of soda and alumina is obtained, mixed with oxide of iron, silica, and a little of the alumina which has not reacted. The aluminate of soda is dissolved out with water (the impurities remaining undissolved), and thrown in fine streams through a current of carbonic acid, by which means alumina is thrown down, and carbonate of soda remains. The precipitated alumina is separated by decantation, and washed with warm water to remove the last traces of soda. In practice no soda is lost, except a small portion converted into silicates, the remainder being recovered by evaporation. The alumina is completely dried, and is ready for final treatment. The manufacture of the sodium has been but little modified. The final reaction which yields the aluminium is effected in a reverberatory furnace. To the double chloride of aluminium and sodium is added about 5 per cent. of sodium; and, lastly, cryolite as a flux. By this means the metallic aluminium is economically and speedily obtained.

THE LATE WILLIAM TEMPLETON.—At the ordinary monthly meeting of the London Association of Foremen Engineers, the reading of Mr. Stanley's paper on a "Substitute for the Slide Link Motion" was postponed (although prepared), in consequence of the serious indisposition of the author. Mr. J. Newton, of the Mint, who took the opportunity of directing the attention of the Association to the painful circumstances which had attended the death of the well-known author of many mechanical and scientific works—William Templeton. Mr. Templeton was born at Caltrine, Ayrshire, on Feb. 8, 1796. He was the father of a large family—namely, seven sons and three daughters—of these, six of the sons were, unfortunately, dead. Templeton was for some time a chief engineer in the Royal Navy—in fact, for five years. He left the service, however, and, for one year subsequently, was located in the Island of Java. Failing health compelled him to leave that place, and he next went to Australia. While there, Templeton superintended the erection of a breakwater at Port Elliott, and wrote a small work, known under the title of the "Commercial Prompter." On returning from Australia, he devoted himself to scientific literature. His principal works are the "Millwright and Engineer's Pocket Companion," "The Steam-Engine Popularly Explained," "Mathematical Tables," "The Workshop Companion," "Practical Examinator," "The Engineer's, Millwright's, and Machin st's Practical Assistant," and others of a like character. The poor author died in London on August 12 last, aged and destitute. The statement as to the sad condition of the widow having been confirmed by Mr. Blackett, it was agreed, on the motion of Mr. Ross, to devote 5*l.* from the funds of the Association to her relief, and to open a subscription list in her behalf. The committee—Mr. William Ross, at Rennie's, Holland-street, Blackfriars; Mr. John Ives, at H. Grissell and Co.'s, Regent's Canal Ironworks; and Mr. Sanson, of 20, Cannon-street, City, will be happy to receive any sums large or small in trust for the widow Templeton, and it is to be hoped that the example so nobly set by the London Association of Foremen Engineers will be generally followed, if not by the public at large, at least by those who have read and profited by the works which Mr. Templeton's great experience enabled him to execute with such considerable skill.

GAS-PRODUCING MATERIAL.—At the inauguration of the Pangbourne village gasworks, Mr. G. Bower, of St. Neots, remarked that he had long come to the conclusion that there is nothing in this country that can compete with coal, be it liquid or solid, for gas making on a large scale, for the elements required to make illuminating gas exist in most coals in the exact proportions required—sufficient hydrogen to heat the carbon, and sufficient carbon to give the light. Cannel coal yields the richest gas, but as the coke from most of it is of little value, and the gas richer than consumers care to pay for, it is only used for mixing with inferior coal. But a great deal depends upon the way in which the gas is burnt to obtain the greatest illuminating power. A poor gas requires less air than a rich one. What would be just enough for the former would be totally inadequate for the latter, for it would smoke, and then people would say "What bad gas it is!" Now, whenever you see ceilings black, suggest a new burner adapted to the character of the gas being burned.

ASSOCIATION OF GAS MANAGERS.—A preliminary meeting of gas managers was held at the Royal Hotel, last evening, for the purpose of forming a British Association of Gas Managers, for the encouragement and advancement of all matters connected with gas engineering, and to facilitate the exchange of information and ideas among its members. The meeting was well attended, and there is every prospect of the association being a success.—*Manchester Guardian.*

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

[FROM OUR OWN CORRESPONDENT.]

ADELAIDE, OCT. 27.—Since my last report, the progress of mineral discovery and development has been very satisfactory. I alluded to the revival of the old Adelaide Mine, within twelve miles of the city, and the fine lode of rich ore which had there been cut. Since then, in driving the adit, a course of auriferous ironstone and gossan has been struck, which promises to be of a highly remunerative character. Gold, at the rate of upwards of 40 ozs. to the ton, has been washed out of the gossan; and a piece of the ironstone, in which the gold was plainly visible, yielded on assay the enormous return of 3626 ozs. to the ton. The discovery is one of the highest importance, and its future development is looked forward to with interest. Other discoveries of copper and gold have been made in the same neighbourhood, near the Montacute Mine, on of the oldest of our copper mines. On Yorke's Peninsula a fine lode of rich grey ore has been cut at the Yelta Mine, adjoining the Moonta. The Messrs. Tuxford are the principal proprietors of this now valuable property, and they have been chiefly concerned in its development, having worked at it most perseveringly for above two years, against much discouragement. On the other side of the Moonta, the Karkarilla Mine has made great improvement, and may now fairly be added to the list of our paying mines. These mines carry the same lodes as the Moonta, and it is now demonstrated that the riches of the latter are not confined to the sections originally taken out by Messrs. Hughes, Elder, and Co. The great dispute as to the title to the Moonta sections is not yet settled. Your readers are probably aware that the Select Committee of the House of Assembly reported against the right of the present holders of the leases, and public opinion generally has endorsed their report. The present holders, however, have the "nine points," which they do not seem at all inclined to give up, and I believe the case is likely to come before the Supreme Court. Messrs. Hughes and Co., having retained all the principal barristers in this colony, the opposite party have sent to Melbourne for Mr. Michie and one or two other eminent gentlemen of the long robe; we may, therefore, anticipate an interesting and smartly-contested case before the judges.

The New Cornwall Mine, which only a few weeks ago was on the point of being stopped, has greatly improved, and is now said to be paying expenses. New discoveries have been recently made on Yorke's Peninsula, and are now in course of being proved. From the position of these discoveries in relation to other mines, it is evident that the mineral wealth of Wallaroo is extensively diffused, and new Mattas and Moontas may yet be found. The Talisker Silver-Lead Mine, at Cape Jervis, has greatly improved, and the satisfactory account sales received from England of the ore have induced the employment of several additional hands, and, as the ore in the mine seems to be abundant, a largely increased yield may be looked for.

A discovery of tin has been reported; but I am not in a position to say whether it is found in quantity, or only a chance specimen. Indications of this metal, however, have been met with in two or three localities.

The Bremer (Worthing Company) Mine is steadily improving, and indications warrant the expectation of good results from the sinking below the 53 fathom level. Other mines in the neighbourhood, as the West Kanmantoo and Paringa, the working of which has been lately recommenced, are turning out well, and yielding splendid ore. The Spring Creek Mine, near Mount Remarkable, looks very promising for a continuance, two good lodes of grey and red oxide having been cut in the adit, where also a little black sulphuret has been met with. This is 16 fms. below the spot where the ore was first discovered on the hill-side. The reports from the Yudanamutana and Blinman Mines continue good. The lodes are holding well, and yielding fine ore, in large quantities. At the Blinman the smelting-works are approaching completion, and it is said that nearly 2000 tons of firewood are already on the spot, for reducing the large quantity of low-class ores, the value of which alone at the Blinman Mine is estimated at 40,000*l.* to 45,000*l.* Some little improvement is said to have taken place in the old Kapunda Mine, and the average quality of the ore is now nearly 3 per cent. higher than it was twelve months since. The noble Burra still holds its proud pre-eminence amongst South Australian mines, and has not many rivals in the world that can show equal results throughout. The half-yearly report just published presents a very satisfactory state of things. More ore has been raised than during the preceding six months, and new ore ground seems to be opening up. Allusion is made to the fact that some parts of the mine appear to be worked out; but after so many years it is not to be wondered at if the shallower levels cease to yield ore as they did formerly. The workings between the 55 and 75 fm. levels are still under water, so that there is still abundance of ground in reserve, as the productiveness of the old workings shows. If wages were 10 per cent. lower than than they are, many of our mines would show better results than they do at present. Mr. Hargreaves, the gold discoverer, is now here under an engagement with the Government to search for gold. He is to receive a salary at the rate of 1000*l.* a-year for six months, all expenses paid, and 5000*l.* reward if he finds a payable gold field. The mining interest generally is rather looking up here; but it is deeply to be deplored that the character of the colony has suffered so much in respect to its mines in the English market. There must, however, be a reaction by-and-bye. The projected railway to the North from Port Augusta will work wonders when it is carried out.

THE ADELAIDE MINE.—His Excellency, the Governor, Mr. and Mrs. J. G. Daly, His Lordship the Bishop of Adelaide, and a party of ladies and gentlemen, to the number of 19, paid a visit to the Adelaide Mine lately. They inspected the mine, and, in the opinion of several of the gentlemen, the discovery of gold on the property was considered genuine. It is found in a lode of quartz and gossan, and, as far as the ground has been tried, the result has been very promising. At all events, whatever may be the value of the gold discovery, the mine is likely to prove valuable in copper. Mr. J. B. Austin, who accompanied the party, is convinced from appearances that the gold exists in payable quantities, and has brought away specimens, which testify strongly to the auriferous nature of the locality. The directors, we hear, do not at present intend working the gold vein, as they desire to complete arrangements already made for cutting the copper lode, and as altogether a different course will be necessary for working the gold.

MR. AUSTIN'S BOOK ON THE MINES.—Amongst the presentation copies of his work which Mr. Austin sent to England was one to His Royal Highness the Prince of Wales, accompanied by a letter to Major Teesdale, the Prince's equerry, stating that the book was forwarded for His Royal Highness's acceptance, the writer believing that the Prince felt an interest in the resources and welfare of the dependencies of the British crown. His Excellency Sir D. Daly kindly forwarded the packet. By the mail just arrived Mr. Austin has received the following note from Major Teesdale:—"Abergeldie Castle, Aberdeenshire, Aug. 11, 1863. Sir,—I beg to acknowledge the receipt of your letter of April 27, and also of the books accompanying it. I have, as you requested, presented your work on the mines of South Australia to His Royal Highness the Prince of Wales, who has been pleased to accept it, and commands me to convey to you his thanks, and to assure you that you are not incorrect in believing that everything which tends to throw light upon the resources and welfare of the colony must ever be of the deepest interest to him.—I am, &c., TEESDALE."—*South Australian Register, Oct. 26.*

MELBOURNE, OCT. 26.—The excess of rain has in most parts of the territory kept the miners well supplied with water for washing out their gold from their stuff, consequently almost everywhere mining operations are going on with great energy and success. Several new rushes have been opened up, and the first fruits of the new silver mines at St. Arnaud have very distinctly appeared. The other day was exhibited in the window of the Messrs. Clarke, the gold brokers in Elizabeth-street, Melbourne, a large cake of silver, weighing between 300 and 400 ozs. This was the first smelted portion of the ore from the ground of the St. Arnaud Silver Mines Association. An experienced mineralogist informed me a day or two back that the whole country about St. Arnaud and Dunolly is "a silver Cornwall," which until recently has been overlooked by ignorant miners, having no eyes for anything but gold. A curious novelty in gold mining has also lately been presented to us. The aborigines have discovered gold on the Warrego River, near Cooper's Creek, almost in the very centre of the continent. They call the metal "culfo," and find it, they say, in the crevices of the rocks. Some fine specimens have been brought to the settlers, and the new country is becoming rapidly peopled.

AUSTRALIAN MINES.

BURRA BURRA MINE.—The half-yearly meeting of the South Australian Mining Association was held in Adelaide on Oct. 21, when the usual periodical report showed that the result of the company's operations had been exceeding encouraging. The quantity of ore raised during the half-year was 4348 tons, which is slightly in excess of the quantity raised during the preceding six months, notwithstanding the unfavourable weather that has prevailed for several months past. For the half-year ending March 31, the ore produced amounted to 4205 tons. The entire profit for the half-year, including sums received from other sources, amounted to 8393*l.* 6s. 3d. The estimated balance divisible amongst the shareholders, after the realisation of the last half-year's produce and the discharge of all liabilities against the association, is 14,225*l.* 14s. 7d. The average produce of the 4348 tons of ore last raised is 23 per cent—a wonderful result, considering the large quantity of ore already produced by the mine, and the depth at which the workings are now being carried on. Capt. Roach, in his report, speaks most favourably of the whole of the workings. In some of the pitches, which have been worked for years, evident signs of exhaustion are presenting themselves, as might be expected; but in the other parts of the mine the yield is good, and the supply apparently almost inexhaustible. It is pleasant to find that while other copper mines of recent discovery are yielding their treasures, the old Burra Burra still keeps up its character. The establishment of the company on Sept. 30 was as follows:—At the Burra Burra Mine, 264 tributers, 52 tutwork men, 53 owners' account and timbermen, being a total of 369 miners. Besides these there are 27 mechanics, 6 engine-drivers, 8 weighers and fillers, 7 stablemen, 13 men variously employed, 94 men and 27 boys ore dressing, 32 labourers, 36 whim and cart boys, 10 officers: total at the Burra, 629. At the Karkaito Mine there were 14 miners, 1 whim boy, and 1 storekeeper. At the Adelaide office there were 4 officers; making a total of 649 persons employed by the company. We see that the wages of the miners run from 30s. to 50s. a week; engine-drivers, 40s.; mechanics, from 35s. to 70s.; labourers, from 24s. to 30s.; youths, from 20s. to 24s.; and boys from 8s. to 15s. It will thus be seen that the company employ a large number of persons at their mines, and

we believe some of the labouring men in England would stare to see the good wages which they obtain. We are glad to find that the old Burra Burra, which has done so much to promote the prosperity of the colony, is still pursuing its successful career, and can hold up its head proudly, even in the face of the wonders of Yorke's Peninsula.

KAPUNDA.—Oct. 26: All going on satisfactorily. The quantity of ore raised in August proved, on weight and assay, to be 365 tons, of 18¼ per cent. average produce, equal to 66¾ tons of pure copper, exclusive of 70 tons sulphur ores for flux. The quantity raised in September was estimated to be 350 tons wet weight, also of good percentage. Since the last advices 80 tons of copper ore had been shipped per *Coonatto*, and 21 tons per *Murray*, both from Adelaide to London.

YUDANAMUTANA.—The directors have advices from their superintendent, dated Adelaide, Oct. 26. He states—"I beg to hand you bill of lading of two shipments of ore, one for 99 tons, per *Countess of Fife*, and the other for 148 tons, per *Clanalpine*. The *Orient* has on board 234 tons: she will take an additional 17 tons, making in all shipped by these three vessels about 500 tons. I could not induce the *Countess of Fife* to take more ore; there will be another vessel at Port Augusta shortly, and I will secure freight by her. I visited the Blinman Mine last week. In looking over the ore at pile for smelting we estimate the value at a low calculation at 40,000*l*. They are not raising so much cartable ore as formerly, at (say) over 30 per cent., although there are some thousands of tons in sight from 30 per cent. down; in breaking out this very rich deposits are frequently found. As soon as the level between Nos. 4 and 5 is holed, a good quality of first-class ore may be expected from the stopes. Upon the whole, the mine looks well for a permanent mine." Capt. Anthony reports under date of Oct. 16.—"Blinman Mine—No. 1 Shaft: The stope in the bottom of the 10, south of this shaft, is not so rich as it has been; the lode is quite as wide, and the bunch of ore is extending further north and south, but the quality is not so good, yet it is still an excellent lode. —No. 3 Shaft: We are stoping the ends and sides of this shaft, from which we are raising a great deal of ore, of 20 percent. average. The "Big Bunch" is still good, though not yielding so much ore as formerly, the branch on which we are sinking being small, but very good. Do not understand me to say that we cannot raise a larger quantity of ore from here, but we are following a branch a large portion of which is cartable ore, and letting the other parts stand over for smelting. The stope south of this is yielding paying quantities of cartable ore, though we are working to great disadvantage; but this will soon be obviated by holing the 10, north of No. 4 shaft, to it. The mine for ores cartable to port (say), 25 to 30 per cent., is not so good as it was last month, but for smeltable ores from 12 to 20 per cent. quite as good as ever. Yield during past month sent to port, 25 tons; to dress, 100 tons; piled, 200 tons, more or less. The stack of smelting-house is 55 ft. from foundation. I hope to report its completion next month. —Yudanamutana: The engine-shaft is down about 2 fms. below the 10; the lode has very much improved. The lode in the open cutting on the hill is not looking so well. The men have raised some fine ore during the past month. The stope, south of Mary's shaft, is still holding good; the lode is about 1¼ ft. wide, of beautiful grey ore.—Wheal Gleeson: No. 1 shaft is down 20 fms., and I am pleased to inform you that we have cut the lode; it is about 1 ft. wide, of iron, mundic, and black ore.—The North End, 10 fm. level: The lode is small, but carrying some good ore; the stopes in this shaft are still looking very well, but the lode is not large. The men have raised some fine ore, but not so much as in the previous month; about 30 tons of copper ore of very rich quality have been raised from this mine. The piles of ore dressed look beautiful, and although there has not been so much ore raised this month as last, I consider the mine is looking more promising. The traction-engines will be on the road in ten or twelve days from this date."

WORTHING.—Oct. 26: There had been dressed from the Bremer Mine 180 tons of ore during the month, of the usual quality. There had in the same period been 48 tons of regulus returned and 2000*l*. worth sold. The quantity of ore on hand at the date of the report was 200 tons, and of regulus 38 tons; expenses for the month, 1403*l*. 0s. 3d. The 15-inch lift had been dropped into place, and the sinking of Legg's engine-shaft to the 63 fm. level continued. The stopes were much as usual, and the appearance of the mine in every way satisfactory—so much so, that the committee were about erecting another reducing furnace.

GREAT NORTHERN.—Capt. Garland, Oct. 14: Nuccaleena: We have divided and cased down the whim-shaft to the 20 fm. level, and put in a pent-house for the supply of the shaftmen while the whim is at work, and we have also removed the whim and stands from the old shaft, and put them up at the engine-shaft. All works connected with the engine-shaft and house are now in good working order. We have commenced to sink with nine men in the shaft, but I have not been able to agree with them in price as yet; my price is 45*l*. per fathom.—Oratunga Mine: I have just engaged four men, whom I intend to put to work on Monday next to clear up the shaft, and in my next I shall be able to give more particulars as to what our prospects are likely to be in that part, and I also hope to have the whim up that we are now making, and at work, and the water forked, when I shall be able to report more fully on the appearance of the lode in that shaft.

MOONTA.—The half-yearly report of the directors shows that during the the last six months the quantity of ore raised from the mines was 5611 tons, which is estimated to yield 18 per cent. of fine copper, and the cost of raising the 5611 tons of ore was 26,833*l*., or 4*l*. 15s. 7d. per ton; and the value being estimated at 66,741*l*., or 11*l*. 16s. 5d. per ton, this shows a profit of 39,508*l*., or 7*l*. 0s. 9d. per ton. A reduction in the price of copper of 5*l*. per ton, as compared with the previous half-year, has, however, lessened these profits considerably, but a reaction having taken place in the demand for copper, the directors state that they look forward to more satisfactory results in their future operations.

ENGLISH AND AUSTRALIAN.—Oct. 26: There were three furnaces and one refinery at Kooringa, and five melting and one roasting refinery at the Port works, and it was expected another furnace would be lighted shortly. The stock of coals was at the Port, 1720 tons; at Kapunda, 908 tons; and at Kooringa, 450 tons, besides about 100 tons of wood. Since the date of the last advices a further shipment of 59 tons copper ore had been made. The company's teams were working well, and everything was progressing very satisfactorily.

WHEAL ELLEN.—A. Hallett, Oct. 27: Our first month's operations are now closed, and during that period we have divided down the engine-shaft, and put in the tramway for drawing the stuff, also removed and refitted the head-gear. Scott's shaft has been repaired from surface down to the 40 fm. level, and can now be used for drawing stuff from that level. The end north is let to four men, at 16*l*. per fathom, for 3 ft.; the end is hard, carrying a leader of ore and mundic, about 3 to 4 in. wide, a sample of which we forward for your inspection. With the exception of drawing water from Bassett's shaft, no other underground operations are going on at present. By erecting the small engine at Bassett's shaft, in an inexpensive manner, we could draw the water by making some alterations in the shaft, and using a tank, to contain about 120 gallons. This would enable us to carry on operations on a more active scale, and thus economise the funds of the company."

SCOTTISH AUSTRALIAN.—Oct. 19 and 22: Cadiangullong Mine: During the month the men employed had continued to blast out the ore floor (meeting with isolated pieces of rich red oxide of copper), and it was expected that in about a fortnight the whole of that portion of the floor from which the over burden had been removed would be taken out, when the ores obtained during two and a half months' stoping would be sampled. The quantity, though generally of high percentage (over 20 per cent.) would not be large, and the prospect of uncovering more of the floor and extracting it appeared less encouraging than it had done. During the month 20 tons of ore had been sampled at this mine.—Canobias Mine: During the first half of the month the men were engaged in clearing out the rubbish which had slipped on to the ore floor in the open stope. During the second fortnight 25¾ tons of ore had been raised and sampled, the best quality ores having been met with at the bottom of the floor; and Capt. Holman states that the prospect for the ensuing month fully warrants the expectation of an increased yield over that of the past.—West Cadia Mine: On Jones's and Icely's lodes (the two main lodes), extending over a long distance on this property, numerous shafts and workings have been commenced. In the surface stopes, at Clark's shaft, on the former over 14 fms. have been excavated, and the men have begun to stope westwestward, the lode yielding over 1 ton per fathom. From these stopes upwards of 34 tons of ore, of above 11 per cent. have been sampled during the month. Lawson's shaft, sunk 3½ fms., has yielded 3 tons of ore of 15⅞ per cent., leaving a similar quantity to be dressed of about 10 per cent.; the lode strong, and continuing to give 1¼ ton of carbonate ore per fathom. The 4 fm. level, at Want's shaft (yielding ores of 13 and 12⅜ per cent.), the 15 east and 15 west at the same shaft (yielding 2 and 1 tons of rich yellow ore per fathom respectively), the 15 east and the 15 west at Rodd's shaft (yielding ores of similar quantity, and varying from 12 to 19¾ per cent.), have all been driven upon and worked during the month. Hall's shaft and Samuel's shaft have likewise been sunk, the latter giving some good black ore and native copper ore. The total amount sampled from this mine during the month is 83½ tons, averaging 11⅜ per cent., and Capt. Holman states that "the six drives will open out a good extent of ground monthly, and if the lodes are only moderately productive it will give fair results."—Smelting Works: Ore on hand, 299 tons; fine copper, 22 tons; wood, 3571 tons.—Colliery: The railway has been finished and tested, and passed by the Goverdment engineer. A sufficient number of coal wagons has been completed, and coals were about to be sent to the port. The following are extracts from the letter of Mr. Morehead, the superintendent, who had just returned from the copper mines:—"Cadiangullong: I instructed Captain Holman to place, bye-and by, two of the men, then at work on the property, to eastean for the continuations of the West Cadia lodes.—Canobias: There are, I think, good grounds for expecting that the workings now in progress, and about to be entered upon, will yield a good produce of fair quality ores.—West Cadia: The prospects here are, on the whole, encouraging as respects the prospects of a permanent mine.—Smelting Works: Mr. Cristoe spoke confidently of sending off 30 tons of copper by the end of the month, and afterwards about 20 tons per month.—Colliery: It will be seen that we are now ready to commence the shipment of coal, and this I intimated to Mr. ——, at Adelaide.

BON ACCORD.—Oct. 26: The further explorations at the south-west corner of the Bon Accord property, ordered to be carried out, have been completed at the depth mentioned—10 fms.—without finding the ore, or such indications as would in the opinion of the committee of management, and those engaged in carrying on the operations, warrant a continuance of them at that depth, nor was the character of the ground at the depth of 10 fms. such as to induce them to recommend the expenditure that would be necessary in order to sink to and drive at deeper levels. The following are extracts from the letter of the chairman of the committee:—"Greatly as it would be to my advantage to make a mine of the Bon Accord, I cannot recommend farther expenditure in proving it. . . . Although we have hitherto met with nothing but disappointment, I have a strong conviction that the Bon Accord is not altogether a blank, and what we have failed to find may possibly be discovered by accident. So firmly am I impressed upon this point, that I am determined not to part with my interest in the royalty. I note your several suggestions as to plan of operations for further exploration. Previous advices will show that, generally, your suggestions have been carried out. I intend to visit the mine this week, to see that everything is left in order, and by next mail we shall be able to forward inventories and close accounts of expenditure on the mine."

FORTUNE.—Capt. Penberthy, Freemantle, Oct. 23: I am happy to state that the machinery is on the mine, and that we shall to-day commence to erect it. Everything will be in full working order in ten days, and when the water is drained to the 40 fm. level (where we have a lode 5 ft. wide, producing 4 tons of ore per fathom), we shall be able to increase our monthly returns. The lode in the north-east end, in the 30 fm. level, would have been cut through before this, but I have been unable to do so for want of sufficient power at surface to draw both water and ore with the machinery employed to the present time; it shall now be done, and reported upon in my next. The cross-cut north-east of the old working shaft, in the 30 fm. level, is driven 4 fms., at which point we shall rise against the new engine-shaft, which is sunk 10 fms., and is progressing satisfactorily. The stope in the back of the 30 fm. level, south-west of shaft, is looking well, producing 2 tons of copper and 2 tons of lead ore per fathom. The ores dressed this month are 30 tons of copper and 23 tons of lead, and 45 tons of copper ore have been sent to the bay." Mr. Samson states in his letter that advices from Champion Bay to Oct. 10 report the machinery erected and the engine at work.

GREAT BARRIER.—Sept. 23: The saw-mill commenced working on Sept. 20, and the manager had already received orders to the extent of about 50,000 feet of timber, at prices varying from 12s. to 19s. 6d. per 100 feet. In the week following the date of his letter, he hoped to send off the first cargo in part execution of these orders. Dixon's dam had been satisfactorily completed, and he had also cut 152,000 feet of Kauri logs up to Sept. 9. By an arrangement made, there would always be a supply of logs ready for the mill, independently of the tide.

THE AUSTRALIAN COLONIES, THEIR CONDITION, RESOURCES, AND PROSPECTS, formed the subject of a highly interesting paper by Sir CHARLES NICHOLSON, Bart., read before the Society of Arts. Sir CHARLES very truly observes that people who live in old communities, such as those of Europe, little know how much they are indebted to the 2000 years of civilisation that have passed before them—in the subjugation of nature, the clearance of forests, the drainage of land, the construction of cities, roads, bridges, churches, colleges, all the innumerable appliances of a high and progressive civilisation, the creation of successive ages, and the fruit of uninterrupted labour extending through centuries. All these, and everything appertaining to civilised life, the colonist has to build up and provide for himself. And yet it is marvellous how much man, when influenced by a resolute will, is enabled to achieve in supplying all that can minister, not only to his absolute needs, but to his comfort and his luxuries. Let a stranger disembark at some one of the larger metropolitan towns of Australia, and he will be amazed at the maturity they exhibit—at the broad and well-paved streets, the handsome edifices, public and private, that every where meet his eye. He will be hardly able to persuade himself that much—in some examples (as that of Melbourne) the whole of this—is the creation of a period less than of a single generation. He will learn with pride how much has been done in so brief an interval by the indomitable energy of his countrymen, and he will not repine at the reflection that his lot has been cast in a period and amongst a race by whom so much as been attempted and so much accomplished. He reminds us that it was not until COOK, in his second voyage, had explored the whole of the eastern coast—to which he gave the name of New South Wales—that any correct idea was obtained of the geographical extent or peculiar productions of New Holland. There are, perhaps, few men of whom England may be more justly proud than of this illustrious navigator. COOK was accompanied by two eminent naturalists, BANKS and SOLANDER. The partial observations and collections which they were enabled to make revealed to them the existence of what might also be consider a new world. They discovered animals and plants, differing from those hitherto known, and presenting few affinities with the Fauna or Flora of the Old World or of America. So isolated, so peculiar, and characteristic did these appear to be, that the wildest speculations were indulged in to account for the phenomenon. BLUMENBACH explained the existence of those exceptional forms of plants and animals by the strange supposition that our planet must have been brought, on some occasion or other, into collision with some comet or great sidereal body, and that the latter had left a portion of its contents impressed on the southern side of our globe. Without reference to such a vague hypothesis, the fact appeared to be established that in the great antipodean region, which it was suggested should be called the fifth quarter or division of the earth, there seemed to exist, as it were, a special creation of plants and animals, curiously fashioned after a type that separated them from the rest of the world. The interest excited by these discoveries was chiefly of a scientific and speculative kind. No practical effort was made to turn the discoveries of COOK to account until after the conclusion of the American war, when the British Government, no longer able to transport its criminals to North America, was under the necessity of providing some other spot, under its own jurisdiction, for the reception of those convicted of offences against the law.

For a full century the 13 provinces which form the nucleus of the United States were convict settlements, and the Australian colonies owe their origin to the same source. After alluding to the establishment of the several younger colonies as offshoots of the original parent—New South Wales—Sir CHARLES gives an able and concise sketch of the physical geography, and then adds details respecting the geology of Australia and its mineral resources, these latter having acquired an importance within the last five years beyond those of any other region of the earth, with the single exception of California. Within 10 years the produce of gold from Victoria alone has, probably, not been less than 100 millions sterling; including that from New South Wales, the aggregate quantity is, probably, not very far from 125 millions sterling. Copper mines have also been worked very largely in South Australia, whilst iron and coal are found in almost unlimited quantities. The great axis extending, as pointed out by him, through a belt of 30°, consists of a series of rocks, most of which would, in the language of British geologists, be included under the designation of "primitive," "silurian," "early metamorphic," and "early carboniferous." There are, perhaps, scarcely any recognisable deposits of an age intermediate between the latter (the carboniferous) and the newest tertiary deposits, many of which contain fossil remains analogous to and indentical with those still living on the same spot. The distinctive peculiarity of the greater number of the Australian mammalia is, that the female is furnished with a pouch, or bag, in which she carries her young. This anomalous organisation seems to have prevailed almost to the exclusion of any other, and to have been so persistent and universal, that in all the fossil mammalia discovered in Australia the same type is found; and as in England and other parts of the world the remains of extinct species of animals, often of gigantic proportions, are found entombed in the soil on which they once lived, so in Australia we find in the newer tertiary deposits the bones of extinct animals of colossal proportions. One of these, named the *Diprotodon* by Prof. OWEN, by whom it has been described, must have been as large as the Indian elephant. It has, however, the peculiarity common to other known Australian mammals of being a marsupial. The remains of animals of the same organic type are found in a fossil state in England, where they seem to have preceded and ushered in higher forms of the mammalian order. These remains are chiefly found in the Oxford slate, and there is, he believes, no question as to their real character, their physiological affinity with the living forms now found in New Holland. A curious and unavoidable inference seems to follow. The marsupial animals of England have long since perished, having been succeeded by other and higher forms of mammals. No similar progression has marked the living organisms of Australia; and we probably see still perpetuated there animals bearing the closest affinity with those that inhabited the centre of England countless ages ago, before the great chalk deposits and all the great superincumbent tertiary strata had been formed. Another example of a living analogue of an extinct European form is presented in the *Cestracion Philippi*, or Port Jackson shark; whilst many of the living species of the vegetable kingdom—such as the *Cycadeæ* and *Araucariæ*—appear to be survivors of a flora that prevailed in Europe during the period of the formation of the coal deposits and the rocks succeeding them.

The central nucleus of the great dividing range is granite, resting upon which are gneiss, mica-slate, clay-slate, crystalline limestone, and quartzose rocks. These are frequently found broken up and disturbed by the intrusion of porphyritic and trap rocks. It is in such positions that gold is generally to be found. The attrition of the rocks containing the precious metal appears to have gone on during a countless lapse of ages, the gold always occupying the lowest level, from its superior gravity, in the mingled detritus in which it is discovered. It is in this condition that it is most easily found and worked. The thickness of the alluvium beneath which the auriferous treasure lies is sometimes enormous, often as much as 300 or 400 feet. In some instances layers of what appear to be volcanic ashes have to be passed through, showing that volcanoes have been in a state of activity at periods subsequent to that in which the precious metal acquired its present relative position. The foci from whence these volcanic products have been derived is still traceable in numerous conical hills, on the summits of which ancient craters are discernible. The rule laid down by Sir RODERICK MURCHISON respecting the "constants" of gold are, he believes, thoroughly verified by colonial experience—that is, the juxtaposition of early crystallins, quartzose, and metamorphic deposits, with trappean and porphyritic rocks. The diggings in Australia are unquestionably exhausting all the alluvial gold, and science and capital are now being systematically directed to the extraction of the ore from its original matrix, or native site in quartz veins, from the disintegration of which all alluvial gold must, at some time or other, have originally been derived. Silver mines have recently been worked to some extent, and afford a promise of yielding a profitable return. The ore is found under conditions similar to those presented by auriferous veins. Copper ore has been found in some favoured spots, yielding larger profits, perhaps, than any operations connected with gold. The Burra Burra Mine is a striking example of this. The quantity of ore at first yielded was so large that for a considerable time all the original shareholders received back the full amount of their paid-up capital every six weeks. Advices have lately reached England that copper mines promising to rival in richness Burra Burra have recently been opened out at Peak Downs, in Central Queensland.

Of all the mineral resources of the colonies the most valuable, perhaps, is coal. The auriferous region is skirted at the east and north-east by a coal basin, the largest diameter of which is probably not less than 600 miles, occupying an area as large as that of Great Britain. In the possession of this great coal field New South Wales enjoys a special advantage over all the other colonies. The growth of cotton is now looked forward to as likely to be a profitable investment of both labour and capital. So great is the anxiety to encourage its cultivation, in both New South Wales and Queensland, that the Government of each of these colonies respectively engages to give a large bounty at the rate of 10d. a lb. on Sea Island, and half that amount on the common kinds of cotton, that may be raised for export within a given period. The first consignment that reached England, a few weeks ago, netted 2s. 6d. a lb., which, with the bounty of 10d. a lb., will yield to the producer a rate equal to 3s. 4d. a lb. Other inducements, in the shape of free grants of land, are also held out, with the view of stimulating the same enterprise. There can be no question that the Australian colonies are capable of producing this great staple to any extent, provided they can command the requisite amount of labour. Human intelligence, human hands, are all that are needed to develope the boundless resources—some still latent, others ready to be seized upon and turned to profitable account—in these magnificent territories. He concludes by observing that it is difficult to see any material obstacle to the onward progress, the unlimited expansion of the Anglo-Saxon race, in the Southern hemisphere. He would not dwell upon the political organisation of the colonies, beyond saying that they possess, each and all of them, constitutional franchises, such as would, he believes, satisfy the more advanced school of politicians in England. If there be in these vigorous societies some drawbacks—an absence of some few of the amenities that belong to certain phases of life in older countries—the want of these is more than compensated for by the heartiness, the rough hospitality, the mutual sympathy, that characterise the relations and the intercourse of all classes. No one is exempt from the stimulus of active, useful exertion of some sort or other; no one is shut out from the privileges, hopes, and rewards of honest industry.

THE IRON MOUNTAINS OF MISSOURI.—IRON MOUNTAIN: This is more properly a tall hill than a mountain. It is of an oblong shape, extending north and south, is about four miles in circumference at the base, and rises about 200 ft. in elevation at the highest point, above the level of the adjoining plain or valley. It consists of a vast mass of iron ore, covered with a sparse growth of scrubby timber. The surface is covered to some depth with loose pieces or fragments of ore. Such was the richness of the ore as to authorise the transportation of it almost as much as the metal itself. And yet, after the immense quantities used by the furnaces are carried away, the supply of loose upon the surface seemed to have been hardly touched. Not only is the surface of this mountain covered with iron ore; but it extends downward to an unknown depth, as was demonstrated in the village at its base; where, in boring for water, to the distance of some 60 or 70 feet it was through a mass of iron ore nearly all the way.

PILOT KNOB.—This is another of these iron mountains, situated at the terminus of the Iron Mountain Railroad, about seven miles south of the Iron Mountain. It is circular and cone-shaped, being about two miles in circumference at the base, and rising to the height of 600 ft. at the summit. Like the Iron Mountain, it consists of a great mass of iron ore, but has but little loose ore on it. The ore is so mixed with silex, or flint, as to cause great loss of metal in the cinder, which is sometimes almost as heavy as the ore itself. But the iron is of very superior quality—perhaps the finest in the world—in fact, almost as fine as steel; the ore being of the character termed "pipe ore." The Knob is surmounted or crowned by an immense mass of rock, mixed with iron ore, with shrubs, vines, ferns, &c., growing in the crevices, presenting a sublime and picturesque appearance at a distance, and resembling the ruins of an old baronial or feudal castle of Europe. The view from the top of the rock is extensive and beautiful, said to extend on the east some 40 miles, or to the Mississippi river. It is said to have taken the name "Pilot Knob" from its having been a pilot or guide to the explorers and first settlers of the country.

SHEPHERD'S MOUNTAIN.—This took its name from Prof. Shepherd, of Yale College, and lies immediately west of the Pilot Knob, across a small valley. It is an oblong, extending east and west, about four miles in circumference at the base, and rises to the height of 630 feet above the level of the valley. It is also a vast mass of iron, the ore lying below the surface, which is thickly wooded with timber.

RUSSELL'S MOUNTAIN.—This is the name of another iron mountain. It is some seven or eight miles north-east of the Pilot Knob, and is equal to the others in extent and richness of ore. Besides these I heard of still another one, about the same distance to the south-west, the name of which I did not learn.—*Missouri Democrat.*

FOREIGN MINES.

ALTEN AND QUÆNANGEN MINES.—Estimated produce for Oct.:—

Mines.	Ore.	Per cent.	Copper.
Quænangen .....Tons	30	7	2·100
Raipas	30	5	1·500
Old Mine	135	4	6·200
United Mines.....	10	4	0·400
Total .....Tons	225		10·200

Mining Report from Oct. 24 to Nov. 18.

QUÆNANGEN—Lode E: The prospects continue favourable in the stope below the 10, which is about 3 fathoms below the level. The lode is divided into two parts, with a quartzose capel between; that against the hanging-wall is 1½ ft. wide, composed of good dredge work and a leader of solid ore of good quality; the latter varies from 3 in. to 12 in. in width. The south portion is very irregular in size, and the ore, yellow and purple, is highly disseminated through the matrix, a fair proportion of which is good dredge work. We have not intersected the lode west of the cross-course as yet; the stratum continues of the same favourable character. The winze below the adit east occasionally yields some saving work, but it has not shown any marked improvement of late, and should there not be a change soon we purpose exploring the lode higher up, where it yielded some good work when passed through. In the adit at C the ground is somewhat stiffer than before. We have recently set a stope on the lode where laid open near the entrance; the indications are highly promising, and the yield of ore has, thus far, been equal to 3 tons per fm. Should it hold so good as at present we shall employ more hands stoping in a short time. Several other points are being wrought on tribute, where there is but little alteration since our last.—Raipas: In the shallow adit stope the ore is still divided into several branches, which, collectively, are worth 2 tons per fm. In the south-west stope a small cross-course has been met with, which has rather disordered the lode, but it is now cut through, and we find the vein making again on the opposite side, it is now about 1 ft. wide, intermixed with ore throughout, with indications of further improvement. The vein of ore in the sink below the 30 west is still small, but very promising, as also is the accompanying stratum; we shall, therefore, continue to sink on its course.—Old Mine: No material change has taken place in the 10 south; the lode is from 3 to 4 ft. wide, with orey work intermixed. In the side stope the lode is 5 ft. wide, yielding about 3 tons per fm. In the rise from the 10 fathom level stopes the lode is 3½ ft. wide, but still mundicky and poor, and as there is evidently a poor bar of ground at this point, we have deemed it advisable to remove the men to stope south from Pederson's rise instead, where at present there is tolerably paying ground. The west stope, north of No. 1 shaft, yields from 3½ to 4 tons of ore per fathom. The adjoining stope has fallen off in value during the past month, but the lode is still from 6 to 8 ft. wide, and we fully expect the present deterioration will only prove of short duration, as the signs are equally as favourable as before. In the 5 fm. foot stopes the lode has also been poorer of late than usual, as noticed in our last, and in consequence we have reduced the number of hands at this point, and at present are only following the most productive parts of the lode, which has, on the whole, improved during the past week. The stope above the 5 yields about 3 tons of ore per fathom, and the lode looks kindly. A number of hands employed at surface and other places during the summer are naturally without any steady places since the winter set in; we have, therefore, employed some of them in stoping in the northern workings, whilst another party is put to rise on the lode from the mid way workings, which place, some two years since, yielded good returns, but when up about 4 fms. the lode became small and poor. Since we began it has improved, being now 1½ ft. wide, worth 1 ton of ore per fathom. There are vast quantities of unexplored ground above our present workings, of which we are led to form a very favourable opinion.—At the United Mines our operations are confined to the points alluded to in our last; each place continues to yield about sufficient ore to pay. We commenced sledging Quænangen ore to the sea port last week, and, the ice on the Alten river being now sufficiently strong, we shall begin at Raipas without delay, and expect, with the present good roads, to make rapid progress at both places. The expenditure on account of mining for the quarter ending Sept. 30 amounted to $9343 4.—CHARLES TRELEASE.

RHENISH CONSOLS.—We are making good progress in sinking the various main shafts. In the bottom of the sink under the adit level, at the Christiania Mine, the lode will yield 3½ tons of sliver-lead ore per cubic lachter. At James Watt's the lode 6½ lachters under the surface, will produce 25 cwts. of lead ore per lachter.

WILDBERG.—We have 34 tribute pitches in operation, and a fair amount of tutwork. The number of hands employed is 308, and our estimated returns for Dec. month is 100 tons of silver-lead ore. The price realised for Nov. ore is Th. 2 26 6 per centner, being 10½ silver groschen less than the price obtained for Oct. ore. The difference is owing to the falling off in the returns from Beck's north lode, and to the increased tonnage of ore of a less richness for silver derived from the Dornergang.

CENTRAL AMERICAN.—Alotepque, Oct. 31: We have great pleasure in stating that all the operations have been carried on without intermission throughout the month, and our sampling exceeds that of September by many tons, the raisings from San Pantaleon being 190 tons, and from San Antonio 31½ tons.—San Pantaleon Mine: The Cornubia shaftmen are progressing with the plat at the San Alfonso, or 40 fm. level under Dolores, as fast, or even faster, than it was at first anticipated; this bargain will be completed in or about another week or ten days from date.—Dolores Adit: No alteration is observable in Curtis's stope from the back of this level, east of the ladder-road winze, from San Damasio, where the lode is 16 in. wide, producing from 4 to 5 cwts. of low quality silver ore per fm.—San Juan, or the 10 fm. level under Dolores: In the underhand stope from this level, east of cross-course, which is over No. 2 stope from the level below, the lode is 20 in. wide, and worth 7 cwts. of good quality silver ore per fm.; the lode in the underhand stope from this level, east of cross-course, and over No. 4 stope from the level below, is 18 in. wide, producing 8 cwts. of good quality silver ore per fm. In the most eastern underhand stope from this level, which is under No. 7 back stope, the lode is 2 ft. wide, yielding about 4 or 5 cwts. of low quality silver ore per fathom.—San Ricardo, or 20 fm. level under Dolores: Six men have driven the level, extending east from No. 2 cross-course, 9¾ varas; 2¼ varas at $12, and 7 varas at $8 per vara; the lode in this end has continued rather small and unproductive; a change, however, in the ground has taken place, so that we may expect an improvement here shortly. Four men have sunk No. 2 winze, sinking from this level, east of cross-course, 3¾ varas, at $10 per vara; the lode in this pozo is still 1 ft. wide, and worth 5 cwts. of good quality silver ore per fm.; this winze has now attained the depth of the level below. In No. 1 stope from the back of this level, east of the cross-course, the lode is 2 ft. wide, yielding from 9 to 10 cwts. of good quality silver ore per fathom. The lode in the adjoining stope No. 2, from the back of the same level, is 18 in. wide, and worth 6 cwts. of good quality silver ore per fathom. In No. 4 stope, from the back of this level, the lode is 20 inches wide, and has produced 8 cwts. of good quality silver ore per fathom.—San Felipe, or 30 fm. level under Dolores: Six men have driven this level going east from No. 2 cross-course, a further distance of 15 varas, at $7 per vara. We are glad to say that the lode has considerably improved in this end, and is now from 20 in. to 2 feet wide, and producing 6 cwts. of good quality silver ore per fm., with a most promising appearance. During the latter part of the month two new stopes have been commenced from the back of this level, east of the cross-course, called Nos. 1 and 2. The former of these stopes extends from the cross-course east as far as No. 1 winze, where the lode is 20 in. wide, producing from 5 to 6 cwts. of fair quality silver ore per fm. In the other new stope, No. 2, which extends from No. 1 winze east a distance of 12 fms., the lode is 15 in. wide, worth 7 cwts. of good quality silver ore per fm., and is daily improving.—San Alfonso Deep Adit: Six men have driven this level, extending east in a direct course by lines towards the shaft, 7¼ varas, at $20 per vara. A decided chance in the ground is observable at this point, which has become softer, and there is a pretty large stream of water issuing from the side of the level, which indicates that the lode is not far from the south of the present end.—San Antonio Mine: San Ramon Deep Adit: Six men, with two boys, have advanced this end east a further distance of 8 varas, at $10 per vara, at which point it is communicated with Ellery's shaft. The lode here is 15 in. wide, consisting of gossan and spar, and contains a little good stamping work. The same level, driving east from Ellery's shaft, has been driven by six men 5 varas, at $8½ per vara. This end has reached the cross-course seen in the levels above, and has thrown the lode south, in which direction the level is now turned, and 1 vara driven. The lode on nearing the cross-course became disordered, but continued to yield a little ore to the end. In the underhand stope, from this level, east of Ellery's shaft, the lode is 1 ft. wide, producing about 6 cwts. of good quality silver ore per fm. The lode in the stope from the back of this level, and east of Ellery's shaft, is 20 in. wide, composed of gossan, blende, mundic, and silver ore, worth of the latter from 1 ton to 25 cwts. per fm., of good quality. We are glad to state that the ley of the ore in this mine has much improved within the last two months. The plat which was commenced in the third week of the present month at San Ramon level is completed, so that the sinking of Ellery's shaft will be resumed on Monday next.—San Vicente: An Englishman, with two natives, have been engaged here during the last three weeks clearing out the old adit level, and have cleared and secured a further distance of 7 varas. From present indications we think that the end of the old workings is not far off; and, judging from a small portion of the vein left standing by the former workers, there is every reason to believe that a highly mineralised and masteriy lode will be soon met with in this mine.

Nov. 2: I have much pleasure in stating that the company's operations have been successfully carried out during the past month. The agent's report will show the highest rate of ore returns yet recorded, and present details of working which will, I trust, meet with your approval. The conveyance of ores to the Hacienda has been well sustained, and I am pleased to find, from month to month, that our stock of mineral is gradually increasing. Every branch of the reduction works has been actively engaged, and 183 tons of mineral were treated during the five weeks past. The conducta for Guatemala will leave on the 5th inst., and will consist of 32 bars, out of the produce of which about $9000 will remain for remittance to England.

Mr. F. KUPER DUMAS, the popular candidate for the seat about to be vacated by Mr. P. CONYNGHAM, may be considered to belong to the mining hierarchy, inasmuch as he has for several years back conducted the extensive and very peculiar blasting or excavating operations on the phosphate island, in the Carribean Sea, known as Sombrero, whence are shipped large quantities of the mineral manure, so much prized by farmers for not only stimulating the growth, but nourishing when grown, almost every description of root grain or herbage. We learn that Mr. DUMAS is also actively prosecuting tramways on the Portuguese and Spanish frontiers, in the direction of San Benito and Logrozan, for the conveyance towards the Tagus of a similar phosphate, an apparently inexhaustible deposit, of which he has become owner of lately, by purchase in perpetuity, at a sum his French competitors were unable to provide within the period prescribed by the conditions of sale.

USEFUL INVENTION.—A Frenchman has patented an invention for pulverising the refuse of slate, and mixing with it some substance which produces a most durable material, and which answers the same purposes as some kinds of our most valuable stone.

HEAT ON SALE.—An American paper states that a scheme is under consideration for warming houses from a central source, and supplying citizens with heat as gas is now supplied.

The fuel question has been solved in Minesota by the discovery of immense beds of peat near St. Paul. It is said to burn as well in a grate as coal, and can be furnished for from $2 to $3 a cord.—*American Paper.*

Prize Medals—International Exhibition, Class 1 and 2.

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The CRUCIBLES manufactured by the PATENT PLUMBAGO CRUCIBLE COMPANY are the ONLY KIND for which a MEDAL has been AWARDED, and are now used exclusively by the English, Australian, and Indian Mints; the French, Russian, and other Continental Mints; the Royal Arsenals of Woolwich, Brest, and Toulon, &c.; and have been adopted by most of the large ENGINEERS, BRASSFOUNDERS, and REFINERS in this country and abroad. The GREAT SUPERIORITY of these melting pots consists in their capability of melting on an average 40 pourings of the most difficult metals, and a still greater number of those of an ordinary character, some of them having actually reached the EXTRAORDINARY NUMBER of 96 meltings. They are unaffected by change of temperature, never crack, and become heated much more rapidly than any other crucibles. In consequence of their great durability, the saving of waste is also very considerable.

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Fully described in the MINING JOURNAL of July 5. 143

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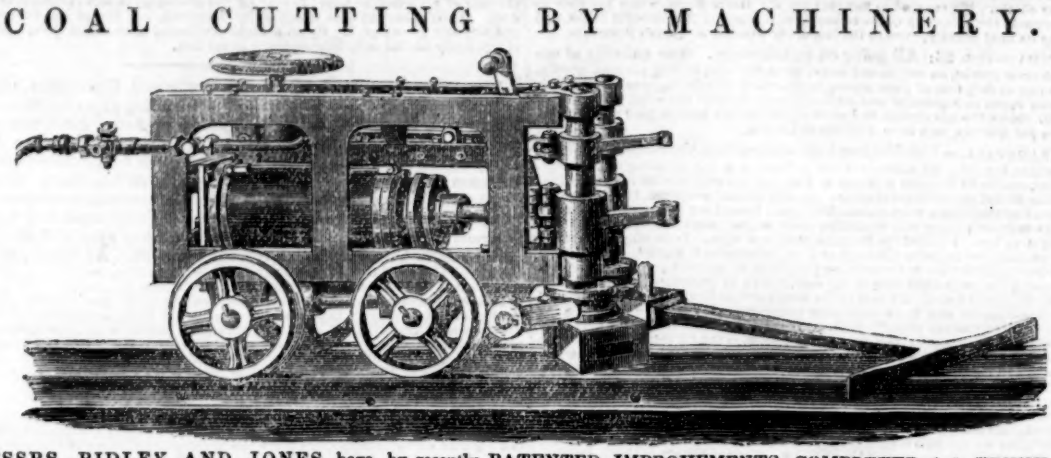

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*** COLLIERY PROPRIETORS are CAUTIONED against PURCHASING or USING MACHINES, the construction of which will constitute an INFRINGEMENT of the ABOVE PATENT. 149

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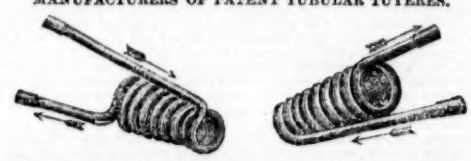

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No. 3 " 20 "	.....	36s. "
No. 4 " 22 "	.....	40s. "
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PUBLIC TEST OF WIRE-ROPE.—

The SUPERIOR QUALITY of GARNOCK, BIBBY, AND CO.'S WIRE-ROPE was FULLY PROVED by a RIVAL MANUFACTURER at the LIVERPOOL PUBLIC TESTING MACHINE, on the 29th of October, 1860, on which occasion GARNOCK, BIBBY, and Co.'s ropes were found to be the STRONGEST of all the TWELVE SAMPLES from different makers then tested, as reported in the papers of the day. For example:—

(Certified by Mr. William Macdonald, superintendent.)

Sizes.	Garnock, Bibby, and Co. Tons c.	Corresponding sizes from other manufacturers. Tons c.	Tons c.
3½ in.	18 5*	16 10	11 10
2⅝ in.	8 15*	7 15	5 0

Remaining sizes with similar results.

* Samples taken promiscuously from stock by a rival manufacturer's agent.

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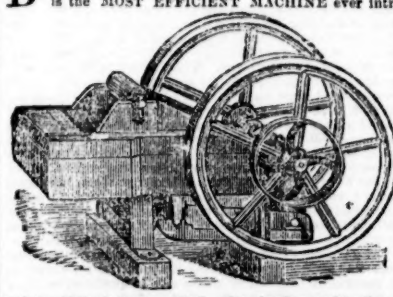
SWAN HEMP AND WIRE ROPE MANUFACTURERS,
LIVERPOOL.

FLAT and ROUND STEEL and IRON WIRE ROPES for MINES, &c., of SUPERIOR QUALITY. 147

TO MINING COMPANIES, IRONMASTERS, ROAD CONTRACTORS, MANUFACTURING CHEMISTS, EMERY GRINDERS, AND ALL WHOM IT MAY CONCERN.

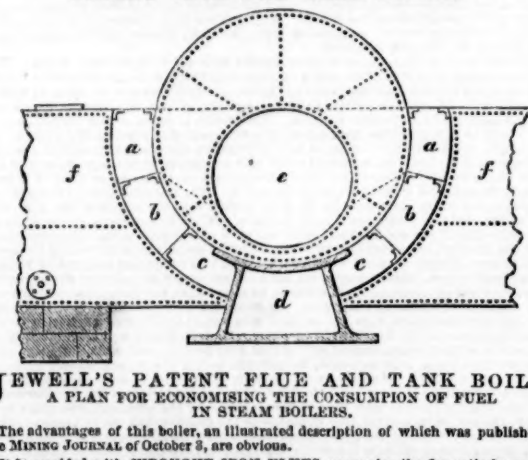
BLAKE'S PATENT STONE BREAKER

is the MOST EFFICIENT MACHINE ever introduced for the CRUSHING HARD MATERIAL, such as IRON, LEAD, TIN, or COPPER ORE, QUARTZ, EMERY, FLINT, &c. It takes in pieces larger than any other machine, and with less power will REDUCE the MATERIAL to ANY SIZE, from 2½ inches to ⅜ inch. Several of the principal firms in this country have adopted it, and find a GREAT SAVING in its use. As the material broken by this machine packs better, it is specially adapted for preparing ballast for railroad purposes, and is fast superseding all other modes of breaking. For simplicity and durability it is unequalled. For circulars and testimonials, apply to—



H. R. MARSDEN, MAKER, SOHO FOUNDRY,
MEADOW LANE, LEEDS. 148

PATENT FLUE AND TANK BOILER.



JEWELL'S PATENT FLUE AND TANK BOILER

A PLAN FOR ECONOMISING THE CONSUMPION OF FUEL IN STEAM BOILERS.

The advantages of this boiler, an illustrated description of which was published in the MINING JOURNAL of October 3, are obvious.

It is provided with WROUGHT IRON FLUES, conveying the fire entirely over the surface of boiler below the water line, and wholly doing away with lime coming in contact with any part of the boiler, lime having been found to destroy the boiler plates before any other parts are the worse for wear. This boiler has four additional flues to the plan at present adopted, thus affording a FAR GREATER AMOUNT of HEATING SURFACE, and MORE EFFECTUALLY CONSUMING the GASES. Between the boilers a wrought-iron tank is fixed, extending the whole length of the boilers, for containing water for feed; this water will pass into the boiler at any temperature required. This boiler will not require anyone to enter the flues for cleansing, as the flues are provided with shifting stoppers at the ends, enabling a person to cleanse the flues even while the boiler is hot; this plan answers for any size or length boiler, and will do away with the cold water feed, which has been the cause of so many accidents. These flues are made of wrought or cast-iron. On the top of the tank a pipe will be placed, to take the waste steam that escapes and carry it to the cistern. The flues for a 6 ft. boiler will be 2 ft. long, and the usual width. It must be remembered that the tank once hot will remain a hot body, with the same amount of heat that passed off before in the brick flues. I would observe that there will be no more water taken from these tanks than will be required for the feed, consequently no more cold water will pass into these tanks than will be necessary for feeding. It is believed this plan will SAVE TEN FEET in the LENGTH of BOILER, and it has been proved to EFFECT a SAVING of rather MORE than ONE-THIRD in the CONSUMPTION of FUEL. These boilers, with flues and tanks, can be supplied on the most reasonable terms.

NOTE.—This plan of Flues and Tank Boiler will be found very beneficial for MARINE ENGINES; the tank would receive the water from the sea, and would not only become hot for feed, but would be the means of preventing in a great measure the salt from passing into the boiler. Where great quantities of hot water are required for other purposes, these tanks will also be found very beneficial. JOHN JEWELL.

Basset Foundry, Devoran, September 30, 1863.

*** Mr. JEWELL is PREPARED to GRANT the ROYALTY to any parties, for certain districts of the United Kingdom. 128

International Exhibition, 1862—Prize Medal.

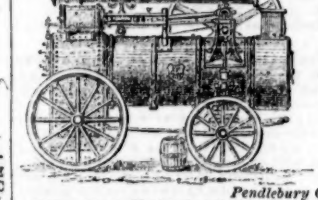
JAMES RUSSELL AND SONS

(the original patentees and first makers of wrought-iron tubes), of the CROWN PATENT TUBE WORKS, WEDNESBURY, STAFFORDSHIRE, have been AWARDED a PRIZE MEDAL for the "good work" displayed in their wrought-iron tubes and fittings.

Warehouse, 81, Upper Ground-street, London, S. 150

Prize Medal, International Exhibition, 1862.

RUSTON, PROCTOR, AND CO.'S CELEBRATED PRIZE PORTABLE ENGINES



are SPECIALLY ADAPTED for WINDING, PUMPING, SAWING, &c. These engines have, in public competition, won the highest honours. For ECONOMY in WORKING, LARGE ALLOWANCE of POWER in CYLINDER AREA and PROPORTIONATE SIZE of BOILER, STRENGTH of CONSTRUCTION, HIGH FINISH, and GENERAL EFFICIENCY, they are unrivalled, having recently been AWARDED THIRTEEN GOLD, SILVER, and BRONZE PRIZE MEDALS, And numerous other prizes.

Messrs. A. Knowles and Sons write:—

Pendlebury Colliery, near Manchester, June 5, 1861.

GENTLEMEN,—We beg to inform you tha twe have now in use the portable engine of 8 horse power you supplied us with, and have great pleasure in informing you that it works well, and we are much pleased with the workmanship and finish of it.

We are, yours respectfully, ANDREW KNOWLES AND SONS.

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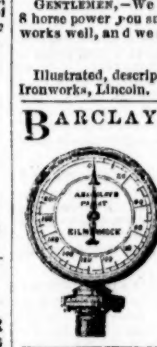
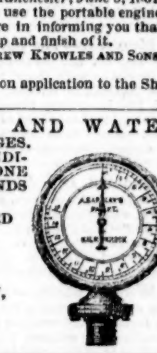
BARCLAY'S PATENT STEAM AND WATER PRESSURE AND VACUUM GAUGES.



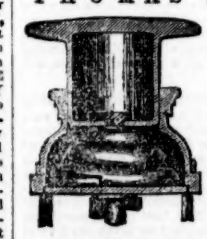


These GAUGES are MADE to INDICATE ANY PRESSURE from ONE to TWENTY THOUSAND POUNDS upon the SQUARE INCH.

EACH GAUGE is GUARANTEED FOR FIVE YEARS.

PATENTEE AND MAKER,
ANDREW BARCLAY,
ENGINEER,
KILMARNOCK. 152

THOMAS TURTON AND SONS,



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